Success Factors and Performance Indicators for health-care start-ups

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Dissertation

Master in Management

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2017

Biographic Note

Carolina Cerqueira Silva Reis was born in 20th May 1994 in Mafamude, Portugal. She completed the secondary school at Colégio Internato dos Carvalhos, under the economic sciences range. In 2012, she entered in the School of Economics and Management (FEP) at University of Porto, starting her bachelor on economics and then her master in management. FEP was a crucial school to achieve a complete development and to obtain knowledge on several topics related to economics such as finance, marketing, supply chain, people management, macro and micro economics, politics and so on.

The desire to have an international experience was achieved during the master degree when she was abroad to Kedge Business School in Marseille under the double degree program. The practical teaching of this school with an international environment was really positive in terms of academic competences, personal views, social skills and travel experiences.

Besides her academic life, she participates in some academic organizations': Fepiano, Grupo Coral da Faculdade de Economia da Universidade do Porto, AIESEC, Sociedade de Debates da Universidade do Porto and on occasion some volunteering experiences that contribute to her personal and professional development.

At the professional level, she worked six month on one of the four big consultants – KPMG, working three (3) months on the fiscal consultancy department and then more three (3) months on the auditing department. This working experience was inserted in the curricular internship of the master. September will bring a new professional experience– working at Sonae MC in Porto.

Besides the academic and professional scopes, Carolina always have been a social person, developing its communication skills, a dynamic person, who always intends to acquire knowledge in several areas, exploring her capabilities by participating in different activities.

Acknowledgments

I would like to thank all that helped me to accomplish this objective.

Specifically, I would like to thank my parents for all their support throughout my academic work and my life journey, which allowed me to get to this point.

I would like to thank professor Nuno Sousa Pereira, my supervisor during this process, for its knowledge in the area, professor Wendy Beatriz Carraro, my co-supervisor in this process, who was always very nice and available to cooperate with me in this work, and finally Maria do Rosário Moreira, always quickly available to clarify my doubts and guide me in this process.

I would like to thank the School of Economics and Management (FEP) and Kedge Business School two very qualified institutions in the process of developing social, professional and academic competences.

To my family and friends for the companionship during all this process contributing to my development. To my colleagues who accompanied me during this academic and professional journey, reached with continuous learning.

Abstract

A recent article published in Jornal Económico dated August 2017, states that the Portuguese are developing the entrepreneurial capabilities and start-ups are being crucial in the process of renovating the productive structure and in the job creation. The start-up profile is changing, with more predominance of individual initiatives, of small dimension and with an exporter profile. Following these trend, in the same line, in August of this year, the Portuguese government announced that it will invest, in partnership with private investors, around 200 million euros in SME's and Start-ups in Portugal, in different business areas. This decision demonstrates the investment that the Portuguese government is doing in fostering and supporting entrepreneurship in Portugal and the trust shown by the government in the Portuguese entrepreneurs, with the aim of proportionating the growth of these start-ups, creating the conditions for them to move out from the initial business phase to a more mature stage.

Having in mind that it is in the first year of activity that most start-ups face the biggest difficulties leadings some of them extinguish to finish their activity, this study aims to help identify the determinants of this reality. By knowing which factors that can bring more success to start-ups, the focus by managers should be on those factors instead of giving attention to less relevant ones. Efficiency in the business is key and as it is known, time is a valuable resource in businesses, so if start-ups know in advance what factors to focus they can be more efficient, save valuable time and succeed quicker. One of the main objectives of this study is to investigate about the factors that can proportionate more success to start-ups in the health area. Furthermore, this investigation, aims to study which are the most suitable indicators to measure the performance of start-ups in the health area in order to choose the right criteria to evaluate their business activity. Start-ups have specific characteristics that makes traditional indicators no longer suitable to evaluate them as they are for big and listed companies. These are the two main objectives and research questions addressed in this dissertation.

After an extensive literature review on the topics related to start-ups' success factors and start-ups' performance indicators, the methodology was applied to the study. It involves developing a questionnaire and testing it in several case studies. Through the questionnaire, the objective was to test which success factors and performance indicators

were applicable in the case of those specific start-ups and through the case studies the objective was to deeper the understanding of the current situation of the selected companies, their main obstacles, success factors and how entrepreneurs think it is more appropriated to measure its performance.

After the collection of the data and the personal interviews with some entrepreneurs, the study concluded that between the identified success factors in the literature, the most relevant for start-ups in the health sector are good control and planning, effective team work, differentiation of the product/service, knowledge and capabilities of the staff, adaptability skills and establishment of strategic partnerships. Regarding the performance indicators, the indicators that entrepreneurs classified as the most suitable to measure the performance of start-ups in the health area are the number of customers, the customer satisfaction, the delivery within the agreed timeframe, the amount of bureaucracy, the staff satisfaction and the accomplishment of the targeted goals. These conclusions are concordant with the literature review and aim to orientate and guide start-ups in the selection of the factors to develop when entrepreneurs initiate their business as well as contribute to an effective control and measurement of the performance of the start-up by choosing the right indicators to monitor its activity. In addition to the conclusions, this study develops a more ambitious objective: develop an aggregated indicator that allows to establish a standardized classification of the start-ups and through a weighted formula classify each start-up according to their performance level.

Keywords: start-ups, health, performance indicators, success factors.

JEL-codes: M13, I11, L25.

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1.Introduction

According to StartUP Portugal (StartUP Portugal, 2017), Portugal exhibits high entrepreneurship levels when compared to the average of Europe. The Portuguese youth are the ones that demonstrate more initiative amongst the EU youth. According to Informa D&B data (Informa D&B, 2016), in April 2016, 3,48 new companies were created by each one that dies. These results are already a positive consequence of the investments in technological infrastructures, in science and the people qualifications that were implemented in the last decade in Portugal.

These companies are important, firstly, because of its contribution to job creation. In 2011, an Ernst & Young study (Informa D&B report), indicated that 2/3 of the new jobs were created by only 10% of the companies. In Portugal, the data indicated that more than 50% of all the new jobs were being created by companies with less than 5 years of existence. Secondly, these companies are crucial because they are being created by a new generation of entrepreneurs: according to StartUP Portugal organization, start-ups are being incepted by a generation that is the most qualified one, that has as acquired values the search for continuous innovation, the investment in design and in the creativity, the social and environmental responsibility, but mainly a bigger vision and ambition. It is also important to mention the impact that start-ups and the dozens of incubators, that have appeared by all over the country in the last 3 years, had in renewal of urban centres, attracting hundreds of Portuguese youths and foreign that choose these centres to work and live, fomenting the requalification of the patrimony and the revitalization of the commerce.

According to the Informa D&B report "The Entrepreneurship in Portugal", start-ups represented 7,1% of the entrepreneurial universe in 2015. Start-ups grow intensively in the first years of existence: on average, its business volume triplicates after two years of existence and it is almost five times higher by the end of the seventh year. The average growth in start-ups is about 136% in the first year, opposing to the 34% in the first year of life in mature companies, 15% in the youth age opposing to the 8% in the youth age (until 5 years) in mature companies and 7% in the adulthood, a similar percentage to what is obtained in mature companies. The number of workers, on the other hand, grows in a slow way, duplicating after seven years of existence.

Despite these positive results, several start-ups do not achieve the desired success. Between 2007 and 2015, only 67% of the companies survived after their first year of activity, 52% until the end of the third year and only 41% survived to the end of the fifth year, and 33% in the end of seven years. Having these results in mind, and to avoid failures, start-ups tend to follow some indicators as determinants to achieve success.

Following the previous logic, it is important to investigate the success factors in start-ups and to control the factors that contribute to their failure. There are studies on this relationship (presented in the literature review), but more work needs to be done on that area. This investigation aims to contribute to that.

Dennis and Fernald (2001) and Walker and Brown (2004) cited in Ferra (2013) refer that the identification of success factors are important to the small entrepreneurs.

Having in mind that the phenomenon of the creation of start-ups is still recent in Portugal, the present investigation intends to contribute to this area. More precisely, the two main objectives of this investigation are first to identify the main success factors for start-ups and second to clarify about the best indicators to measure the performance of the start-ups in the health area, in Portugal. The two following research questions can be formulated and desirable answered by the end of this investigation: 1) What are the main success factors of the start-ups installed at UPTEC acting on the health sector? And 2) What are the most suitable indicators to measure its performance? This dissertation project aims to be an initial step to create an aggregated indicator that evaluates and classifies a start-up on a standardized ranking taking into account different parameters. This investigation aims to contribute for the definition of a guideline that could orientate start-ups on which factors to develop to achieve success and which indicators are more important to monitor in order to correctly measure the performance of their activity. This should help start-ups, allowing them to save time and consequently money.

It is pertinent and useful to study success factors in start-ups because as stated by Paoloni and Dumay (2015), while there has been much research examining the critical success factors of social networks on large firms, there has been far less research with focus on micro-enterprises.

This dissertation is structured as follows: in section 2, the importance of the start-ups in the economy is discussed, some international comparisons are analysed and a literature review is done, identifying the success factors and the performance indicators in start-ups. At the end of

that section, four similar studies are stated. The third section describes the adopted methodological procedures, the hypotheses of the investigation are described and the application of the questionnaire and the case studies are introduced. The fourth section includes the characterization of the sample and the interconnection between the literature review and the obtained results. It is followed by conclusions, some contributions for theory and practice as well as some limitations of the study and suggestions for future studies are done. Whenever appropriated, for a better organization of the work, the sections are divided in sub-sections.

2.Literature Review

This chapter analyses several different theories about the main topics of this investigation: the success factors and the performance indicators related to the start-ups in the health sector. In the section 2.1. the general concepts and characteristics about start-ups are introduced and their importance in the economy is analyzed. In the following section, 2.2., the theme of the internationalization of the start-ups is discussed as well as some international comparisons are presented. Then, in section 2.3. relevant literature review about the factors that contribute to the success of the start-ups is discussed. The same logic is applied for the next section, 2.4., but this time related with the analysis of the suitable indicators to measure the performance of start-ups. Finally, in the last point, section 2.5, four similar studies are introduced. Some synthesis is provided throughout all the chapter through relevant tables and figures.

2.1. The importance of start-ups in economy

2.1.1. Start-ups' definition

According to Scarmozzino *et al*. (2017), start-ups are young and small firms that, due to their high-tech products, tend to get international from an early stage of their evolution through slow and non-parameterized gradual stages. Many of these high-tech firms are characterized by high level of innovativeness and by the strategic relevance played by knowledge assets and knowledge processes in the company.

Spender *et al*. (2017), defines start-ups as companies, partnerships or temporary organizations that are designed to search for a repeatable and scalable business model.

A different definition presented in the literature defends that a start-up is an organization constructed to grow rapidly. (Graham, 2012).

In turn, Ries (2012) argues that a start-up is a human institution designed with the objective to create a new product or service under conditions of extreme uncertainty.

In the following table (table 1) a synthetises of the main start-up definitions can be found, stated by its author.

Definition of start-up	Author(s); Date
Start-ups are young and small firms that, due to their high-tech products, tend to internationalize from an early stage of their evolution through slow and non-evolutionary gradual stages	Scarmozzino *et al*. (2017)
A start-up is a company, a partnership or temporary organization designed to search for a repeatable and scalable business model.	Spender *et al*. (2017)
A start-up is an organization constructed to grow rapidly	Graham, (2012)
A start-up is a human institution designed to create a new product or service under conditions of extreme uncertainty.	Ries (2012)

Table 1. Main start-up definitions

2.1.2. Characterization of the Start-ups' growing phases

Besides the analysis of the several definitions of start-ups, it is pertinent to explore the different start-up phases. There are several criteria to define the start-up phases. In this study, it will be adopted the definition stated by UPTEC (Parque de Ciência e Tecnologia da Universidade do Porto). Following that definition, start-ups go through three different phases – the pre-incubation phase, the incubation phase and the internationalization phase. In the pre-incubation phase, the projects that are being developed are in an embryonic stage, where the company may not be yet legally constituted. In this stage, the entrepreneurs, develop its business model, test their products in the market and develop the prototypes of its products and services. In the incubation phase, the business idea already achieved a considerable maturity respecting to the business project. The legal constitution of the company must be already executed. In this stage, companies must work actively in the process of the entrance in the market, acquiring their first clients, continuing at the same time, improving the solutions provided to the costumers. Finally, in the internationalization phase, that is the last phase in the incubation process, it is expected that the company enlarges its costumers' portfolio as it enters in new markets and launches new

products and/or services. During this phase, it is expected that the company expands the business to an owned physical work space, where it can maintain a positive environment for its development and continuous and sustainable growth. The presence of innovation and the transference of technology and knowledge as background is constant.

In the next table (table 2), a resume of the several start-up phases, can be found.

Start-up phase	Main characteristics
Pre-incubated phase	Embryonic phase: company is not legal constituted, development of the business model, test the products/services, development of prototypes.
Incubation phase	Achievement of maturity, operationalization of the legal constitution of the company, market entrance.
Internationalization phase	New markets entrance, launch of new products, ownership of a physical work space, continuous and sustainable growth.

Table 2. Start-up phases

2.1.3. Start-ups' characteristics

Before explore the multi importance of start-ups in the economy, it is useful and important to understand its characteristics and the environment in which they operate.

As stated by Smith M. and Smith D. (2006), it is already well known that start-ups present different characteristics from those presented by larger organisations. This happens because of the structural and cultural environment that exist in these companies that is different from larger organisations. Three different but complementary variables can and need to be studied to characterize start-ups in a complete way. They are the organisational environment, the competitive environment and the management practices.

Starting with the organisational environment, Smith M. and Smith D. (2006) argue that one of the most present factors that distinguish start-ups from other companies is related to the

organisational environment in which start-ups operate, which is defined by its organisational culture. There are several types of organisational culture such as hierarchies, market culture, clan culture and adhocracies. According to the investigation, the one that is frequently observed at start-ups is the adhocracy model. This type of organisation is flexible, dynamic and prepared to take risks to succeed. Start-ups fit in this category as they usually have horizontal structures with a reduced management hierarchy, they are flexible and adaptable to a constantly changing business market and they always keep up with a tendency to innovation. The following figure (figure 1), graphically represents the organisational culture in which start-ups are inserted.

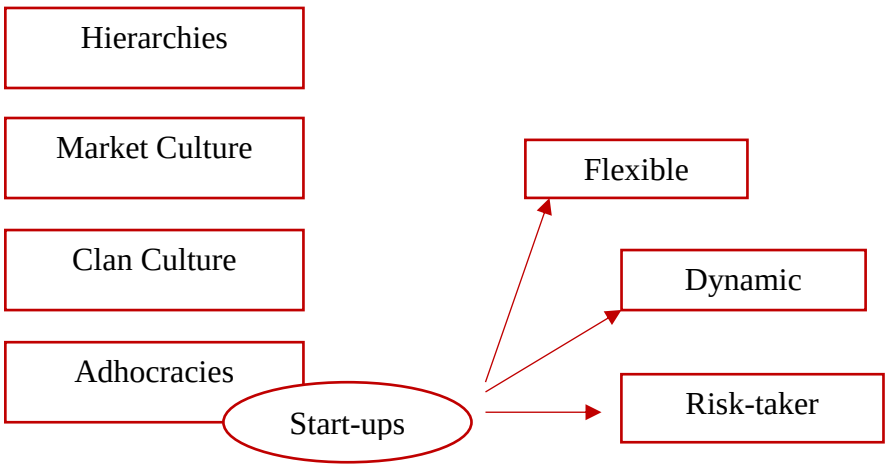


Figure 1. Organisational culture of start-ups

Following Smith M. and Smith D. (2006) thoughts and in the scope of the competitive environment, start-ups are positively classified as flexible and adaptable to the market changes. However, sometimes start-ups only have a limited view on the markets in which they operate, conducting to a miss of control over their competitive place. Due to its dimension, they cannot lead the market but they should react and fit in the market changes. However, according to Miller and Whitney (1999) as cited in Smith M. and Smith D. (2006), this approach suggests poor organisational configuration, which is harmful to keeping competitive advantage. A well – known advantage of start-ups, due to their characteristics, which allows for more personal and personalized relationships that is extremely valued by the customer. (McAdam, 2000). However, this brings a disadvantage too. The research has demonstrated that start-ups in part, lose control of their future because of the requirements made by stronger customers. This power from the customers over the start-up can be noticed from the fear to pressure costumers to pay

its debts as start-ups are afraid to lose the costumers. This is one of the scenarios that mostly affects start-ups due to their financial weakness they cannot operate with late payments. Shyly appearing in the middle of this scenario is strategic planning that should be at the round table but that is put side. Several times entrepreneurs only react and do not follow a carefully planned strategy. In addition, Harris and Ogbonna (1999), found that several times the initial strategy implemented by the founder is not reviewed and it is maintained over the path of the company, which is a failure in the process. Another common mistake is to rely only on financial information, which can lead to the misunderstanding of the reality of the start-ups. Start-ups should manage both financial and strategic alignments as it is proved that this leads to a better global performance of the start-up.

The next point that characterize start-ups is the management practices. According to the authors, the effectiveness of the organizational environment in which start-ups operate is highly influenced by its managers. In start-ups, the management of the company is centralized in one person, usually the owner-manager or a selected manager. As studied by Hannon and Atherton (1998), there are four types of managers going from the ones with low strategic attention and low capacities of planning to the ones with good strategic attention and high planning capacities. The authors suggest that each type of manager has a different impact on the on-going business. Finally, Brouthers *et al.* (1998), typifies some characteristics of start-ups regarding control: it is less influenced by politics, less controlled, less rational and in the opposite more intuitive than in large companies, which, has its own advantages and disadvantages.

In the following figure (Figure 2), it is possible to find a resume of the previously exposed characteristics.

Figure 2. Start-ups' main characteristics

2.1.4. Start-ups' importance in the economy

The importance of start-ups in the economy can be noticed by several perspectives. According the Informa D&B report, besides its role in innovation, start-ups are important due to their contribution to the economy renovation and for the job creation. They have the ability to attract foreign capital and to be a good investment when they are acquired by other international companies.

Start-ups are responsible, on average, for 18% of the jobs that are annually created by companies. Portugal has been stated as a good destiny for the international investors and start-ups intensively contribute to this scenario. Among the companies in Portugal that are owned by foreign capital, start-ups represent 6,7% of them, what correspondings to 434 start-ups. Sometimes, young companies are more attractive for investors – 20% of the companies that were acquired between 2007 and 2015 had 5 or less years of existence when they were acquired.

According to Ghezzi (2017), start-ups are responsible for the reinvention of new business concepts, what he names "Reinventing the Wheel". Examples of this disruptive start-ups are Airbnb, Uber and WhatsApp. For Halabí (2014), there is no doubt that new businesses introduces constant changes and dynamism in the economy and can make contribute to its development.

As stated by Spender *et al*. (2017), start-ups play an important role in innovation processes. Through start-ups, new ideas are brought to the market and converted into economically sustainable enterprises.

Paoloni and Dumay (2015) states that small business are key drivers of economic growth. Bieraugel (2015) wrote that start-ups are responsible for managing the innovation and they are committed to create radically new innovative services.

Scarmozzino *et al*. (2017), agree that the change from an economy based on industrial production to an economy based on information and knowledge has increased the importance of innovation as a variable for social and economic development. The emergence of start-ups is one of the most evident results of this shift.

As stated by Kane (2010), start-ups are responsible for the growth of the net job in the economy. During recessionary years, job creation at start-ups remain stable, while at existing firms, jobs are highly sensitive to the business cycle, contributing to some of the job losses.

Schumpeter (1943) cited in Talaia *et al*. (2016), stated that entrepreneurial activity fosters the innovation and technological change of a nation. Moreover, Stevenson and Jarillo (1990) and March (1991), both cited in Talaia *et al*. (2016), defined entrepreneurship as a process whereby firms and individuals(entrepreneurs) explore and exploit opportunities, leveraging their ability to manage uncertainty in a pro-active way. Start-ups are considered a way of entrepreneurship, so it can be concluded that in an indirect perspective, start-ups foster the innovation and technological change of a nation.

2.2. Start-ups' internationalization

2.2.1. The process of internationalization

Internationalization is perceived as a slow and incremental process and is a survival opportunity for start-ups. Global start-ups internationalize virtually from their inception. They challenge theories that consider internationalization as an incremental process with several stages over a long period. Nevertheless, an increasing number of researchers had started to questioning the

(over)significance on quick internationalization on early stages of companies. (Schueffel *et al*. (2014)).
International new ventures are new ventures that seeks profits from international activities right from its inception or immediately after. (Turcan and Juho, 2016). Start-ups that internationalize themselves are considered international new ventures.

Internationalization is important for start-ups. It provides bigger competitiveness but bigger markets too. Entrepreneurs have the challenge to adapt to different kinds of costumers and different market rules. The percentage of exporting start-ups has been increasing in the last years (from 7,1% in 2008 to 10,1% in 2014). Exports assume big importance to start-ups, absorbing 63% of its business volume (Informa D&B, 2016).

2.2.2. International Comparisons

In order to positioning Portuguese start-ups in Europe, this analysis will focus on international comparisons between Portugal, France, Germany, Italy, Spain and the United Kingdom. Tables (Table 1 to 4) and figures (Figure 3 to 6), are presented in order to visualize the main trends and conclusions about international comparisons.

The following information is extracted from the SEP platform, the first pan-European platform with the purpose to transform European start-ups into scaleups by linking them with global corporations. It was established by the European Commission in January 2014 at the World Economic Forum in Davos. (Start-up European Partnership (2015) a)).

It is important to notice that the current analysis is limited to Information, Communications and Technology companies (ICT companies). Other key areas in the start-up ecosystem such us biotech/life science, hard-tech and cleantech, are yet under investigation and are not included. (Start-up European Partnership (2015) a)).

All the data used to elaborate the tables and figures was extracted from the SEP reports of each country. (Start-up European Partnership (2014), (2015)). SEP defines start-up as a company that raised less than one-million-dollar of funding since foundation and had at least one funding event in the last five-year period.

The first analyse is about ICT scaleups. Start-ups are considered Scaleups when they go beyond the one million dollars funding raised, since its foundation. Besides that, the scaleup requires at least one funding event in the last five-year period. (Start-up European Partnership (2015) a)). Scaleups occurred within the six countries are represented in the Table 3 and Figure 3.

Portugal	40
Italy	100
Spain	100
Germany	218
France	250
United Kingdom	400

Table 3. ICT Scaleups

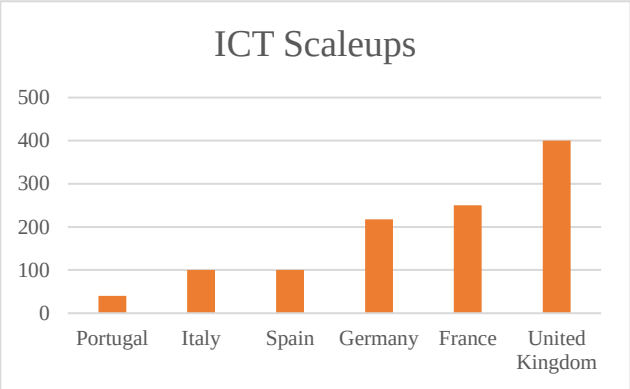


Figure 3. ICT Scaleups

Regarding the number of Scaleups, Portugal is by far the one with fewer number of scaleups, not even achieving half of the numbers of Italy or Spain that are the closest to Portugal. The United Kingdom is the country with the higher amount of scaleups, four times more than Italy or Spain.

The second analysis is about the amount of money raised by scaleups from investors. These amounts are represented in billions of dollars and they can be found in the Table 4 and Figure 4.

Portugal	1,66
France	2,1
Italy	2,875
Germany	5
Spain	5,175
United Kingdom	9

Table 4. Money raised

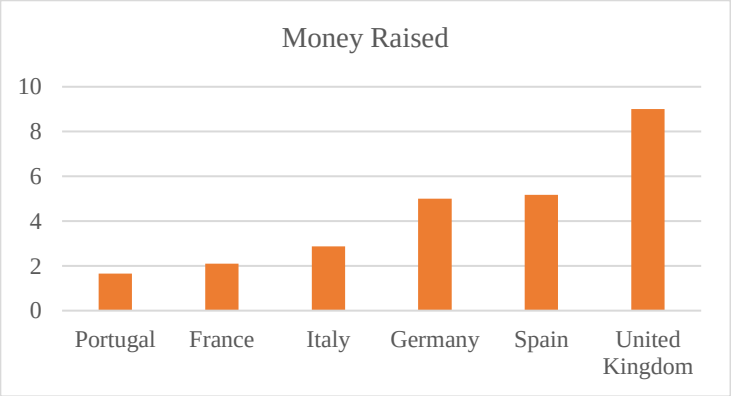


Figure 4. Money raised

Portugal raised around 1,66 billion dollars of money from several investors. The nearest one is France with 2,1 billion dollars. The largest amount raised is from the United Kingdom, with 9 billion dollars of raised funds. It is important to notice that the values of Spain and Italy were obtained through estimation, as they were not stated in the text.

The third analysis is about the number of exits experienced in each country. SEP characterizes Exit as a liquidity event that occurred in the last five-year period. (Start-up European Partnership (2015) a)). Exits can be materialized in Mergers and Acquisitions (M&As) and Initial Public Offers (IPO). The numbers can be found in the Table 5 and Figure 5.

Portugal	9
Spain	30
Italy	32
France	55
Germany	110

United Kingdom	-

Table 5. Exits

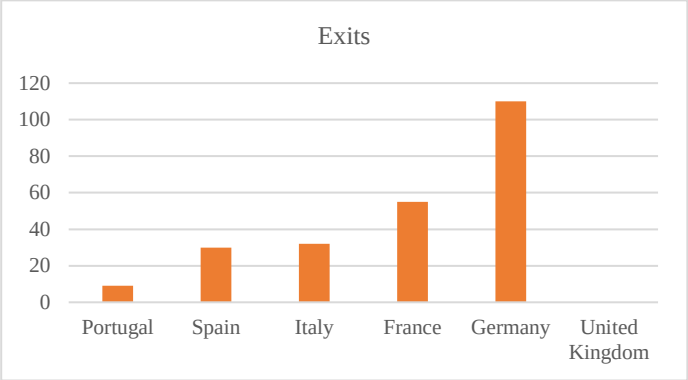


Figure 5. Exits

Portuguese start-ups experienced 9 exits and none of them was an IPO. By exclusion all of them were M&As. Spanish start-ups experienced 30 exits with 1 IPO and 29 M&As. Italy had 32 exits, about 5 IPO's and the other 27 were M&As. France presents 55 exits, with 7 IPO's and 48 M&As. There is no data for the exits, M&As or IPOs in the United Kingdom. A substantial part of the exits in each country are executed by US companies. The values are presented in percentages and this analysis is presented in Table 6 and Figure 6.

Spain	30%
Italy	33%
France	36%
Germany	37%
United Kingdom	60%
Portugal	67%

Table 6. Exits by US companies.

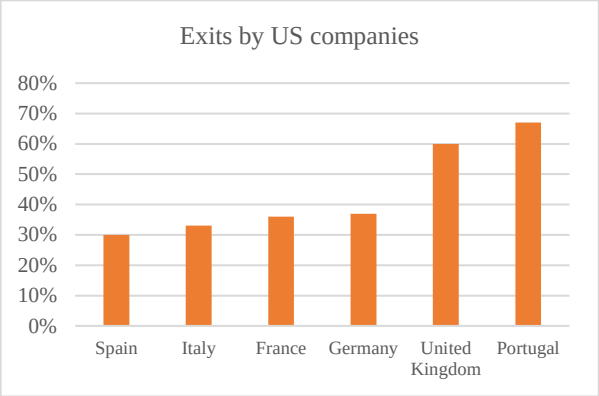


Figure 6. Exits by US companies

It is possible to notice from the above table and figure that Portugal is the country with the highest percentage of exits operated by US companies. Italy, France and Germany are near of each other and the biggest gap between the six countries occurred between Germany and United Kingdom. In relation to exits operated by national companies, Portugal did not operationalize any, Germany operated 31%, France 35% and Italy near 41%. In the cases of Spain and United Kingdom there is no data to available.

The following analysis is focused on scalers. SEP defines scalers as the companies that raised more than 100 million dollars in funding since foundation and had at least one funding event in the last five-year period. Portugal had not yet experienced any scaler event, at the time of the elaboration of this report. Germany has already experienced 7 scalers and the United Kingdom had experienced 15 scalers. Data regarding Italy, Spain and France were not available.

Concerning the biggest area of scaleup there is an emergence of Software solutions and E-commerce in the analysed countries.

2.3. Success factors in start-ups

2.3.1. Theoretical review

One of the research questions of this thesis addresses success factors in start-ups. For that, first it is important to define what is considered success at start-ups.

One of the theories about companies' success is the Porter's theory (1980) that states companies (start-ups are included here) are considered competitive and capable of a sustained development when they work on a balance of 5 forces model: the strength between the market competitors, the strength of the entrance of new competitors, the strength of the entrance of new or substitutable products, the strength of suppliers and the strength of buyers. This theory allocates the concept of sustainable growth rate as a necessary condition for the company to succeed (Ferra, 2013).

Besides that, and according to Cusumano (2013), many start-ups also require "complementary" products (such us software applications) or infrastructure components (such us Wi-Fi), that according to Andy Grove of Intel can be called the "sixth" industry force. This additional force is needed in order for start-ups to succeed.

However, it is necessary to distinguish between two different concepts: success and performance. (Ferra, 2013). Performance is the analysis of the result of a performed action or activity (Slack, 1997 cited in Ferra, 2013). The measure of performance is the quantification of a previous action. (Neely, 1998 cited in Ferra, 2013).

On the other hand, success in start-ups can be defined by subjective factors inherent to the creator of the company and its manager, that generally are very important for start-ups. For example, success can be defined as the "sustained satisfaction of the stakeholder's ambitions". (Jennings e Beaver, 1997 cited in Ferra, 2013).

Another theory of success is the resource based view theory, that argues companies represent heterogeneous mixes of resources and capabilities. The objective is to acquire and assemble these resources and capabilities to gain a competitive advantage and pursue success. To gain a competitive advantage, these resources and capabilities should be valuable and rare, and difficult to imitate or substitute (Konno, 2015). This is the VRIO framework, a tool used to analyse firm's internal resources and capabilities to find out if they can be a source of valuable sustained competitive advantage. (Jurevicius, 2013).

To pursue success, a company must adapt constantly to a changing internal and external environment. (Konno, 2015).

Moreover, Konno (2015) argues that companies that can find rare resources in their industry at start-up level are likely to be successful and, then, continue with its business. And for business continuation, manager's experience is also important.

Continuing in the theory of Konno (2015), another point related with company success is the manager's age. The age of the manager influences its managerial ability, and the capacity to secure the required resources and capabilities. Companies with older managers are less probable to discontinue business. However, if old managers retire and successors are difficult to find, then the business may suffer.
Another factor developed by Konno (2015), regarding the company success is the ability to borrow money. The author states that companies that borrow money at the start-up level are more likely to survive. The author considers this as the first indicator of success. (Beaver, 2003 cited in Ferra, 2013).

According to Halabí and Lussier (2014), there are six (6) factors that contribute to the success of the business developed by a start-up. These are working capital, record-keeping and financial control, industry experience, management experience, planning and use of professional advice. However, there is still some controversy on this subject because some other different studies concluded that these factors are not crucial for start-ups success.

Related to this study, it was concluded that successful firms intensively use the internet, start to operate with more working capital, kept updated and accurate financial and accounting information, developed detailed plans, invest in marketing, business owners have a higher level of education and partners are positive to the development of a new business (Halabí and Lussier, 2014).

Still in Halabí and Lussier (2014) research, it is argued that there is a recent tendency that measures success according to the business owner's objectives rather than an imposed "one size

fits all benchmark". It is the current trend for personalization instead of the standardization of the criteria to a global universe.

Other studies analysed some independent variables such as the size of the firm, the age of the business and the industry area that could impact in the success of a start-up.
Regarding the size of the firm it was concluded that small firms are more likely to fail than large firms (Reynolds, 1987 cited in Halabí and Lussier, 2014). Regarding the age of the business, new firms have a higher probability of experiencing a bad performance than established and mature business, and new business often lose money (Halabí and Lussier, 2014). Regarding the industry conclusions, Lussier (1996a, b) cited in Halabí and Lussier, (2014), states that service and retail firms tend to present higher failure rates.

A different group of researchers has investigated which factor impacts more a start-up success: location or communication (Allen *et al.*, 2016). Besides that, another variable was added to the list: the network position. Some studies showed that more central team managers lead to more productive teams (Sparrowe *et al*., 2001; Cummings, 2007 cited in Allen et al., 2016). However, the opinions about this topic differ as it is possible to state in the following statements.
Raz and Gloor, (2007) cited in Allen et al., (2016), argue that start-ups whose CEOs communicate more with their peers are more successful.
In the study of Allen *et al.*, 2016, was stated that the closeness to the geographic centre of the cluster will increase communication (Allen *et al*., 2009 cited in Allen *et al*., 2016), but will not increase innovative capabilities of start-ups.
By its turn, Uzzi, (1996); Raz and Gloor, (2007) cited in Allen *et al*., (2016), state that being embedded in a social network is more important than geographic proximity, as being embedded in the communication network increases business success.
Allen *et al*., (2016), also stated that rotating leadership is a predictor for the success of the start-up.

Paoloni and Dumay (2015), argues that in micro-enterprises the creation of a network to support customising production, creativity, talent and personal skills is crucial for the survival and growth of the start-up.

Another important factor for start-up success is the relational capital. It is constituted by several formal and informal, temporary and permanent relationships, that can be helpful to develop the business (Paoloni and Dumay, 2015).

According to Michiels (2017), the major part of small enterprises such as start-ups are composed by family members. This variable will be important in this dissertation in order to understand if one of the factors related to the success of the start-ups is to be family composed.

By its turn, Omri et al. (2015) claim that human capital and social networks are part of business success in start-ups. This happens because they allow innovation that leads to success.

Entrepreneurial capacity is referred in the literature as an important factor to achieve success by Lewrick et al. (2011). The authors state that entrepreneurship contributes to successfully manage innovation and the growth of the start-up.

According to Lafuente et al. (2013), one of the factors affecting small business success is internationalization. Besides this, others factors are considered important, such us finance, marketing, innovation and sustainability.

Harris and Ogbonna (1999), explore the crucial role that founders can have in conducting to start-up success or not. They have a big influence in shaping the culture and strategy of the business.

Adams and Skyes (2003) cited in Ferra (2013), point out as a success factor everything that is connected to the innovation process: the development of new products and the integration of new technology are here included as strategic partnerships. They state that companies that use the most recent technology tend to effectively capture its customers when compared to its competitors.

A good balance between price and quality is pointed by Chu et al. (2011), as one of the important factors affecting the success of the start-ups. In addition to this, hard work and good customer services are two additional factors the authors consider crucial in the start-up success.

Klyver and Grant (2010), studied the reasons why there is less probability of a women to become an entrepreneur and to lead successful start-ups. One of the reasons they find is that women lack role models in their social networks that are crucial to starting a business. Besides that, Kropp et al. (2008), argued that in the past, in developed countries, men started more businesses than women and consequently have more chances to succeed in the business world. However, nowadays, an increasing number of women are starting businesses.

Kropp et al. (2008) in their study, find that there is a negative correlation between the academic qualifications of the entrepreneur and the probability to start a business. They concluded that older and less educated entrepreneurs are more likely to start ventures and consequently lead them to succeed.

In order to better understand the consumers, it is important to develop and implement suitable market studies. Chittithaworn et al. (2011), include this factor on the marketing analysis. The increasing transformation in the economy led to a growing commercial aggressiveness, conducting to the need to understand the market, trying to prospect its evolution and anticipate it with the right measures, having in the basis marketing techniques.

Mason and Harrison (2006), argued that other relevant factors in the start-up success are the national and international supporting tools and funds. Once Portugal joined the European Union, there were benefits sourcing some of the community funds such us *FEDER, Fundo de Coesão, FSE, FEADER and FEAMP*.

One of the highlighted characteristics by Al-Mahrouq (2010) for the success of the start-ups is the continuous training on the human resources in the company. The author declares that low employee turnover is due to the typically familiar path present in small companies.

The following three factors are more specifically related to the health sector. They are about the influence and power exercised by the government, the regulatory aspects and the intellectual property valuation.

As claimed by Majava et al. (2016), the three-way match of collaboration between academic institutions, industry and the government is a good combination. It triggers good innovations and the creation of new organisations and institutions such as start-ups and its incubators. However, in the health sector, there are some special features. For example, nowadays in Portugal and according to the Health Cluster Portugal report, on average, people live longer and consume more health services than before. They are more aware of the prevention that needs to be done to live longer and healthier. This scenario affects the government expenditure and some adjustments needed to be made in order to make some decisions based in a benefit and cost relation. The governments need to implement several restrictive measures assure the sustainability of the system and rationalize the resources. In the current study, one of the objectives will be to understand if the influence, presence and power of the government is a positive or a negative factor influencing success of start-up health business.

As it is publicly known, the health sector is a highly-regulated. In Portugal, and as stated in the Health Cluster Portugal report, "Entidade Reguladora da Saúde", is the public and independent entity responsible for the regulation of the activity related to the health care establishments. As stated in the work of Baganha (2002), the government is responsible for the health policy as well as for its execution. This regulatory subject is analysed in the current dissertation to understand at which level the amount of regulation prevents or fosters the success of the start-ups in the health sector.

The intellectual property is another important subject in the health sector. As argued by Chu and Andreassi (2011), there are conflicts related to patent issues, such as what is or is not susceptible to patent, to whom belongs the patent right and the level of detail of the object to be patented.

The slowness in the analysis and allocation of the patent acquisition includes also risk and uncertainty for the start-up, which may incur in losses in the negotiation process in the process of the technology transfer.

The intellectual property rights, are related to several dimensions such us universities and research institutes, incubators and biotech companies.

Nowadays, and due to the large amounts of knowledge and information acquired and investigated by start-ups, it is possible to find some start-ups that didn't sold any product yet,

but they have high valuation due to its intellectual property and investigations. So, this is a crucial, regulatory and valuable area that needs to be properly protected in companies. In this dissertation, this topic is studied to clarify if the intellectual property is an incentive or an impediment factor.

2.3.2. Resume of the main success factors in start-ups

Based on the above reviewed literature, it is useful to sum up the main factors that contribute for the success of start-ups. The resume is present in the next figures (figure 7 to 12). The figures are organized by author following the main success factor stated by each one of them.

Main success factors in start-ups

Ferra (2013)	Cusumano (2013)	Konno (2015)	Halabí and Lussier (2014)
• Porter's theory • Sustainable growth rate	• Porter's theory - 'sixth force'	• Theory of resource based view • Adaptability to the external and internal environment • Manager's experience • Manager's age • Ability to borrow money	•Working Capital •Record keeping and financial control •Manager industry experience •Manager management experience •Planning •Use of professional advice •Use of Internet •Marketing analysis •Level of education •Partners in the business •Size of the firm •Age of the business •Industry area •Information

Figure 7. Synthesis of start-ups' success factors by author (1)

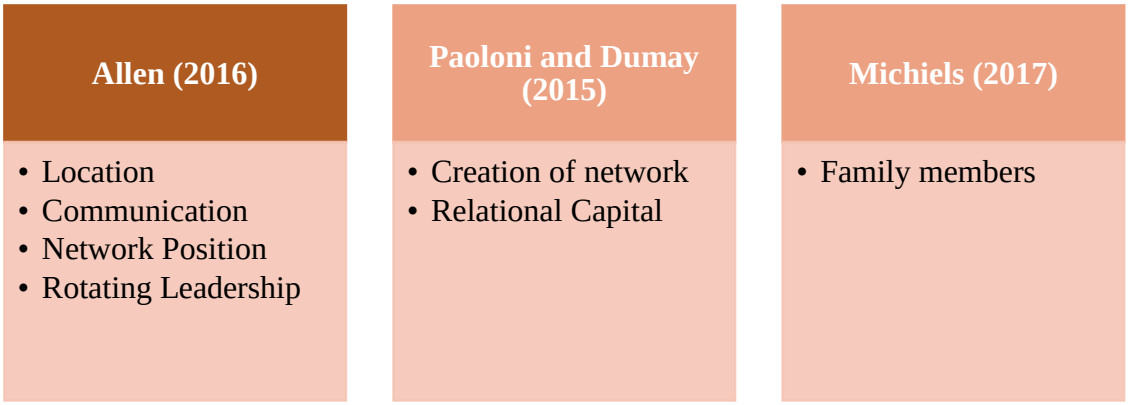


Figure 8. Synthesis of start-ups' success factors by author (2)

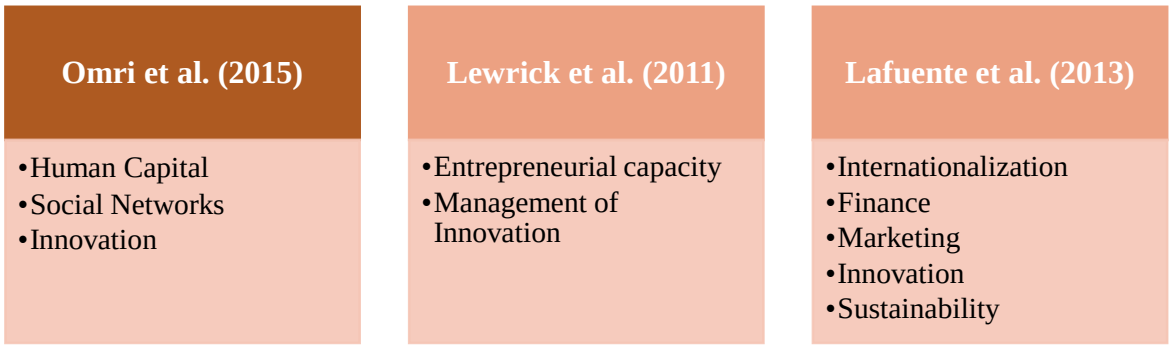


Figure 9. Synthesis of start-ups' success factors by author (3)

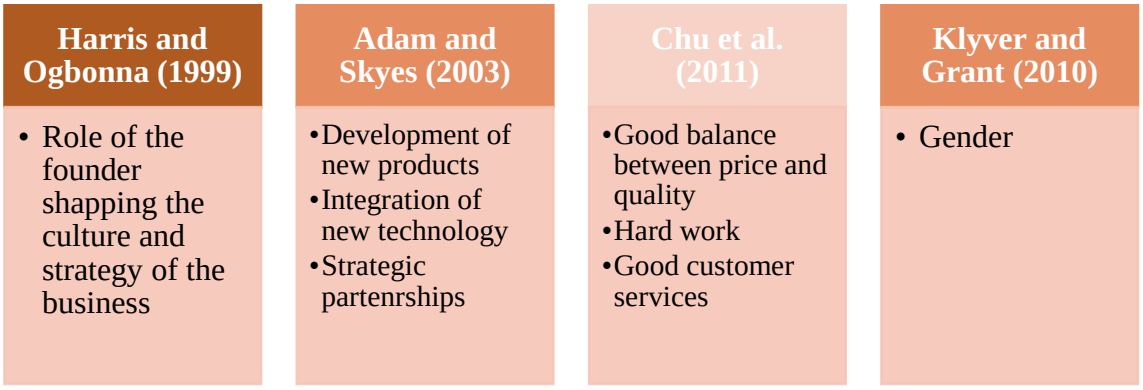


Figure 10. Synthesis of start-ups' success factors by author (4)

Figure 11. Synthesis of start-ups' success factors by author (5)

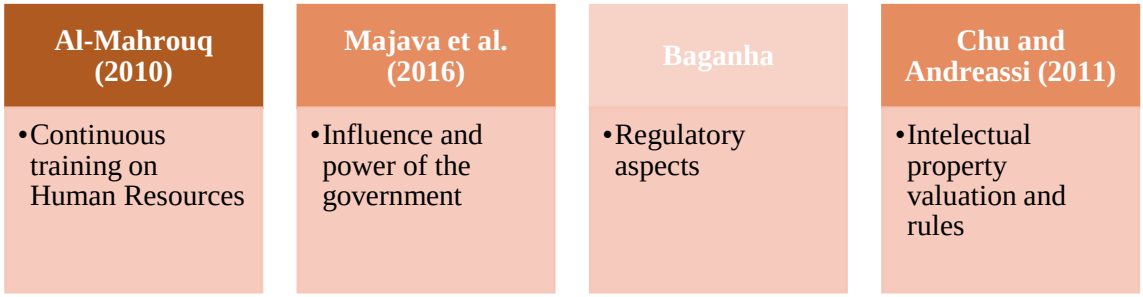


Figure 12. Synthesis of start-ups' success factors by author (6)

As it is possible to state from the previous resume, there are several factors that different authors mention in their studies. They are grouped as follows (figure 13):

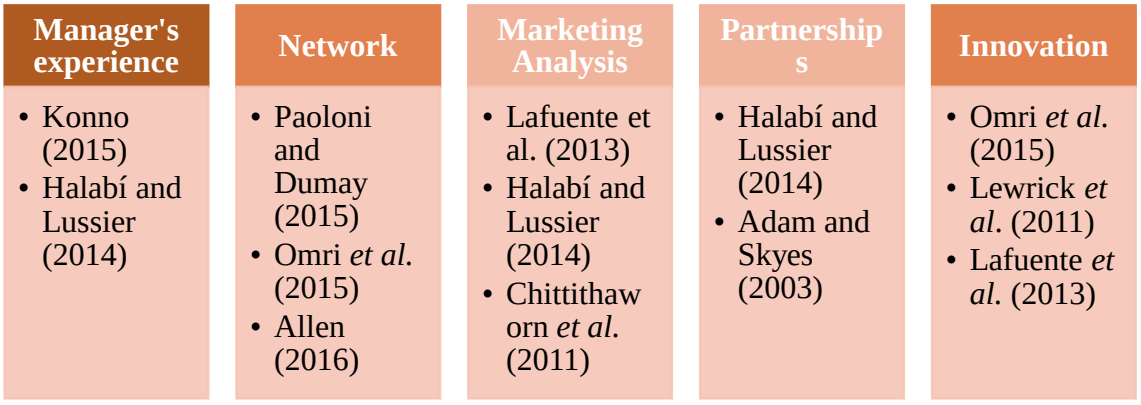


Figure 13. Common success factors mentioned by different authors

The success factors can also be divided into the three next different areas: the success factors connected to the characteristics of the context, the success factors connected to the characteristics of the entrepreneur and success factors connected to the characteristics of the business. This logic can be exemplified in the next figure (figure 14). In this figure the success factors are organized by category.

To group the factors in the respective category on an effective way, it is necessary to discuss the definition of each category. They are presented as following.

Using the definition of Dey (2001), context is defined as the information that can be used to characterise the situation of an entity. Consequently, an entity is a person, place, or object that is considered as relevant to the interaction between the user and the application, including the user and the applications themselves.

In the article of Thompson (2004), an entrepreneur is defined as a person who usually creates and innovates to build something of accepted value around identified opportunities.

Following Bititci and Muir' (1997), business can be defined as a group of structured activities designed to produce a specific output.

Characterisitcs of the context	Characterisitcs of the entrepreneur	Characterisitcs of the business/company
•Porter's theory (sixth force) •Adaptability to the external and internal environment •Industry •Innovation •Sustainability •Strategic partnerships •National and community funds •Influence and power of the government •Regulatory aspects •Intelectual property valuation and rules •Available Information	•Manager's experience •Manager's age •Manager industry experience •Manager management experience •Level of education •Communication abilities •Network Position •Rotating Leadership •Relational Capital •Gender •Human Capital •Social Networks •Entrepreneurial capacity •Capacity to innovate •Role of the founder shapping the culture and strategy •Hard work	•Theory of resource based view •Sustainable growth rate •Family owned business in small companies •Ability to borrow money •Market analysis and studies •Working Capital •Record keeping and financial control •Planning •Use of professional advice •Use of Internet •Marketing analysis •Partners in the business •Size of the firm •Age of the business •Internationalization •Finance •Marketing •Development of new products •Integration of new technology •Good balance between price and quality •Good customer service •Continuous training on Human Resources

Figure 14. Success factors by typology

It is possible to conclude from the previous literature review, there are different perspectives depending on the author that developed the study and the analysis that was made. The authors interpret the subject on different perspectives, each one influenced by its academic and life background and professional experience.

2.4. Performance indicators in start-ups

2.4.1. Theoretical review

As famously Merchant (2006) and Peter Drucker said respectively, “What you measure is what you get.” and “What gets measured gets done.” These two sentences initiate the discussion about the importance of the performance systems in start-ups.

Performance in start-ups needs to be monitored to achieve the desired results and to analyse the gaps between the planned performances and the obtained performances. Several times at start-ups the failure in the achievement of goals is related to the absence of an appropriated management control system. Nowadays, software and computational systems are used to monitor the performance at the company (Ferra, 2013).

Regarding the definition of performance measurement, the most cited one is by Kennerley and Neely (2002), that states that performance measurement is the process by which the efficiency of past actions is quantified.

This process of measuring the performance can be done using several instruments. Between them, there is the Management Control Systems (MCS). MCS are devices or systems that offer to (top) managers useful information to effectively plan, control and evaluate. (Chenhall, 2003 cited in Anne-Mie and Ann, 2014). (Top) Managers use these systems to control and guide the behaviour and decisions of employees in the definition of the organization’s objectives and strategies (Horngren et al., 2008 cited in Anne-Mie and Ann, 2014).

Regarding the evaluation systems, Anne-Mie and Ann (2014), consider there are the following systems to monitor the performance: the subjective ones, the flexible and the rigid financials systems.

As quoted by Clarke-Sather *et al.* (2011), more and more companies are aware of the importance of the performance measurement systems and want to measure, improve, and report their actions.

The pressure on companies to monitor its performance is in part originated from external agents such us international organizations, governments, stakeholders and markets that require transparency and improvement of non-financial variables of business performance.

Because of that, Clarke-Sather *et al.* (2011), state that this scenario has led to the development of some systems for companies to monitor their performance. The development of indicators intends to tackle not only the decisions on what is important and relevant to analyse, but also what is meaningful to quantify.

Some of the actual performance indicators and assessment systems are fostered by experts such us politicians, policy makers, social or natural scientists. They usually have the focus on the business or nation, as company driven processes (Clarke-Sather *et al.*, 2011*).*
Clarke-Sather *et al.* (2011), argue that some of the usual dimensions of the evaluation performance systems are economics, environment, societal impacts, institutional and organizational concerns. This is a broad performance system with the inclusion of several dimensions rather than a strict financial perspective.

For example, the society category encompasses the impact of the performance in the different stakeholder's agents including workers, customers, local communities, suppliers, human rights, political involvement, corruption and product safety.
The environmental category encompasses energy, materials, water, waste, emissions, land effects, environmental management and standards.
Institutional and organizational dimension addresses company board and upper management functioning, risk management and brand management.

Of course, in the case of start-ups all these dimensions and indicators should be adapted as all these dimensions are not yet totally developed and present. Moreover, this performance systems needs to be viewed as an investment and because of that the benefits and costs needs to be managed. According to Clarke-Sather *et al*. (2011), due to its dimension and financial resources, whose priority is to manage the daily operations and expand the product through several markets, sometimes start-ups cannot afford to have a performance evaluation system.

Traditionally, there was a tendency to intensively use financial indicators, such as the return on investment, return on sales and prices variance (Pun and Hosein,2007), when compared to the non-financial indicators (Beaver, 2003, defends that these are more important than the financial ones), to measure the performance. However, some studies concluded that financial indicators were not enough due to the complexity of the organizations and markets. Nowadays, the utilization of only financial criteria is not suitable and more and more organizations are using both types of measures in performance evaluations (Ferra, 2013).

According to Neiva dos Santos *et al*. (2015), one of the main determinants of the mortality of small and medium enterprises is the poor management performance in the company. If start-ups monitor the performance, that will allow control, planning and analysis in a complete way. In this case, the company's decisions and procedures can avoid the mortality of the start-up.

According to Merchant (2006), performance measures are connected with several incentives, both extrinsic and intrinsic, incentivizing or retracting workers when taking the actions. The objective of these incentives and penalties is to guide the behaviour of the workers. They exist as an incentive to their actions.

The personalization of the performance measures is important. For example, the measures used to monitor the general's manager performance should be different from the ones used to monitor the sales workers. They need to be adaptable to the different functions within the company (Merchant, 2006).

According to Saunila (2017), often, in start-ups, the measures are limited to the production activity. However, scholars have studied that measuring several different areas in the start-up such as innovation strategy, ideas and ideation, customer and market, organizational learning, knowledge management tools, organizational culture and leadership is important for the success of the start-up as well.
Contextual differences (differences in managerial culture and management systems), in start-ups have made the use of performance measurement more difficult, but are extremely important at start-ups. Based on the specifications and needs of start-ups, investigators have suggested that start-ups require specific performance measures. (Saunila, 2017).

As pointed out by Neely *et al.* (2000) cited in Saunila, (2017), performance measurement shouldn't be considered as disruptive and contradictory but as a useful and needed tool for the start-up to succeed.

According to Saunila (2017), performance measurement can contribute to a significantly better understanding of the activity of the start-up when the measurement has been conducted properly.
The measures should be changeable and developed based on the experience of the start-up.

Performance measurement must be given more strategic and operational importance to obtain benefits.
Additionally, a wide range of measures of performance should be adopted to reflect the diversity of the company.

According to Bititci *et al.* (2012) cited in Saunila (2017), performance measurement has traditionally been focused on the study of companies from traditional performance measurement perspectives, such as production and finances. Although it is recognized as difficult, innovation performance measurement is vital to contribute to innovation in the start-up.

Garengo et al. (2005) state that, in recent years, the complexity of start-ups has increased. The authors highlighted start-up's sensitivity to differences in the managerial culture and management systems.
In these companies, performance measurement systems(PMSs), play an important role in supporting managerial development.
However, many factors seem to constrain PMSs implementation at start-ups, such us lack of financial and human resources, wrong perception of the benefits of PMS implementation and short-term strategic planning.
For Neely *et al.* (2002), a PMS is a balanced and dynamic system that can support the decision-making process by gathering, elaborating and analysing the information.

According to Hudson et al. (2001), one of the most popular and known PM system is the balanced scorecard which includes both financial and non-financial variables in the analysis to achieve strategic alignment. That is considered a good model because it balances both dimensions of the business. Van Der Stede et al. (2006) argue that the mere use of non-financial measures has disadvantages, such us the difficulty to objectively establish parameters for this type of measures, or the wrong application of the subjective measures, due to its complexity.
PMS's should support start-ups to deal with uncertainty, to innovate their products and services, and to maintain evolution and changes in its processes.
Recently, some changes have created a favourable scenario for the implementation of PMS's at start-ups: the evolution of the competitive environment, the evolution of the concept of quality, the increased focus on permanent improvement and several developments in information technology (Garengo et al., 2005).

It is common that start-ups have lack of strategic planning and are not totally aware of their critical success factors. (Greatbanks and Boaden, 1998 cited in Garengo *et al., 2005*). The right use of the performance measurement indicators can help to act on that issue in order to improve it.

According to Tenhunen et al. (2001), usually, in start-ups, only the owner/manager knows what are the strategies and objectives for the company. The process of creating a PMS's require the start-up to implement a strategic planning. When the company puts it in practice, the gap between the actual and the desired performance is highlighted. Because of that, PMS's help the start-up to define future objectives and manage the necessary improvement processes.

Smith M. and Smith D. (2006), studied that, firstly, the concept of strategically aligned performance measurement (PM), was allocated to a traditional and financial level in the 1980s and 90s. Then, the aim to link financial and operational measures to stakeholder's demands and match these with the global strategy of the business increased. This holistic approach encompasses several dimensions: customers, finance, internal business processes and learning and finally future growth.

However, the bigger part of this global approach was designed for and tested in large companies. Due to its structural and cultural characteristics, sometimes it is difficult to

implement this global approach in start-ups. That is why it is important to develop and test specific performance measurements in small companies just like Smith M. and Smith D. (2006) explore in their research. They conclude that due to the typically scarcity of its resources and due to its strategic flexibility (which is considered a key point), this system is difficult to implement.

Findings from Smith M. and Smith D. (2006) suggest that in the case of small companies, it is expected that both management and process visibility tends to be higher due to the existence of few workers and simple structures. These characteristics should facilitate the introduction of performance measurement by simplifying the communication process, helping to certify that every employee knows the direction that the company is going on. Besides that, planning should be flexible, pragmatic and a continuous process, with the necessary decisions taken quickly and with the less possible amount of bureaucracy.
McAdam (2000) suggests that it is difficult to convince start-ups managers about the long-term advantages of shifts, when they already live in continuing changing environments. Because of that, McAdam (2000) argue that a good solution is to manage both long and short term advantages and that performance measurements can adapt to the rapidly changing environments of start-ups.

Ferra (2013), argued that the customer satisfaction, the bargaining power and the deadline accomplishments are viable indicators of the start-up performance in the market. In fact, if there is a good and effective customer service, the performance levels of the start-ups will be better.

According to Spillan and Parnell (2006), one of the main marketing objectives is to understand the customer and keep the organization informed about the changes that occur in the clients' needs with the objective to deliver higher value.

For start-ups, the non-financial measures are more relevant, identifying the staff satisfaction, the accomplishment of the targeted objectives and proud in the job as some of the criteria that measure the performance, as Beaver (2003) concluded.

Several times, performance measures involve analysis of success. The success factors generally included in the performance analyses are five and, as it was exposed in previous paragraphs, they include financial and non-financial variables. (Sun et al., 2005).

They are the management of the organization, the process, the technology, the data and the human resources. In sum, they include attitudes and values, competencies, technologies, leadership and work group.

2.4.2. Resume of the main performance indicators in start-ups

The research on performance measurements in start-ups is yet an intensive debated area, with different opinions and the contribution of several authors, being a multidisciplinary area. However, and undoubtedly, what can be concluded in this section is the consolidated balance of several dimensions within the company instead of only one dimension, to monitor the performance of start-ups due to its intrinsic complexity and its several dimensions proportionated by the speed of the markets where companies nowadays operate. One of the most present and debated themes is the combination between financial and non-financial measures. As reported in the previous literature review, in the past, financial measures were used almost exclusively. However, in the most recent years, managers understood that companies encompass several dimensions (and not only the financial one) and to represent the company in a complete way, the several dimensions need to be measured and adopted. Recently, with the global presence of start-ups, specific studies tried to adapt the traditionally performance measurements that are applicable to the biggest companies to the start-ups. They should be adapted to the specific and complex environment of the start-ups in order to align present and future objectives in a holistic approach. In the following figure (figure 15), a resume of the performance indicators by author is done.

Saunila (2017)	Ferra (2013)	Smith M. and Smith D. (2006)	Spillan and Parnell (2006)	Beaver (2003)	Pun and Hosein (2007)
• Number of units/products/services produced • Number of patents • Number of customers • Conquer of new markets • Amount of sales • Amount of profits • Financial performance	• Bargaining power • Deadline accomplishments	• Amount of bureocracy	• Customer Satisfaction	• Staff satisfaction • Accomplished objectives • Proud in the job	• Rounds of investment

Figure 15. Synthesis of start-ups' performance indicators by author.

2.5. Similar Studies

2.5.1. Identification of similar studies

The analyse of similar studies is important to understand what type of work and research has been done in this area, and to identify possible gaps in the research that this dissertation can address.

During the research, it was possible to notice that there aren't lots of studies targeting both the success factors and the performance indicators in health care start-ups. It was possible to collect four studies, two relating each research question – two (2) of them respecting the first research question about the success factors and the other two (2) respecting the second research question about the performance indicators.

The following table (table 7), presents the four papers referring their author(s), the aim of the study and the main conclusions.

Study Title	Author(s)	Aim of the study	Main Conclusions
Small business start-ups: success factors and support implications	Watson, K., Hogarth-Scott, S. and Wilson N. (1998)	One of the objectives of the study is to understand which are the determinants of success and failure in start-ups.	One of the conclusions of the study was that growth start-ups experience success factors such as the ambition in the objectives related to the business, managerial skills in the employment of people as well, leadership and motivation skills. They also highlight the importance of the training and advice received in the leadership and motivation fields as well in the staff training and recruitment fields. The entrepreneurs consider that all these factors positively impact the success of the start-up.
Success Factors in New Ventures: A Meta-Analysis	Song, M., Podoynitsyna, K., Bij, H., Halman, J. (2008)	Motivated by the highly death rate of start-ups with more than 5 employees, the study has the objective through a meta-analysis to determine which are the relevant factors for the success of the company and which are not. This study balance the theory methods with the real-business situations.	It was concluded that among 24 possible success factors identified in the literature, 8 of them are statistically significant when it respects to the success of the start-ups. They are the supply chain integration, the market scope, the firm age, the size of the founding team, the financial resources, the founder's marketing experience, the founder's industry experience and the existence of patent protection. On the other side, 5 were not statistically relevant – founders' research and development experience,

			founders' experience with start-ups, environmental dynamism, environmental heterogeneity and competition intensity.
SME-oriented implementation of a performance measurement system	Tenhunen, J., Rantanen, H., Ukko, J. (2001)	The aim of the study is to investigate how the small and medium enterprises implement performance analysis systems.	The study concludes that among several performance indicators, the most important dimensions to measure are customer satisfaction, quality of the processes and products, financial indicators and employee satisfaction. This investigation concludes as well about the number of suitable indicators used to measure the performance: 5 to 25 measures is the scope to be used, depending on the size of the SME.
Theory and practice in SME performance measurement systems	Hudson, M., Smart, A., Bourne, M. (2001)	This study intends to analyse the theory and practice in SME's about the performance measurement (PM) systems. It describes the analyse of the current PM processes that are based in 6 fundamental dimensions of performance (Quality, Time,	The study concludes that besides the validity of the actual PM systems, SME'S did not adapt their actual PM systems to improve them. This alerts for some barriers in the process. To overcome these barriers, the PM systems must be resource effective and produce notable short term, as well as long term benefits, to help maintain the momentum and enthusiasm of the development team. In addition, it must be dynamic and

		Flexibility, Finance, Customer Satisfaction and Human Resources). Each critical dimension globes several indicators used to measure the performance.	flexible enough to accommodate the changes of the emergent strategies.

Table 7. Similar studies

Some limitations should be mentioned: the first and the second study do not tackle the health-care start-ups but start-ups in general.

The third and fourth studies are directed to SME's and not to the start-ups in particular.

However, these were the most related studies that were found on the literature and it is possible to analyse that there are several coincident topics related to what it was investigated in the literature review of this dissertation. For example, some of the performance indicators that the study concluded that should be analysed are present in this dissertation. The same happens with the success factors present in the second study, they are coincident with the ones identified in this dissertation.

2.5.2. Methodological aspects of similar studies

In the following table (table 8), a resume of the relevant methodological aspects of the reviewed similar studies is made, in order to posteriorly compare them with the methodological aspects of this dissertation.

Study name	Author(s)	Country of analysis	Sample size	Business sector	Company typology	Collection of data	Answer rate	Key informer	Unit of analysis	Statistical analyse	Period of analyse
Small business start-ups: success factors and support implications	Watson, K., Hogarth-Scott, S. and Wilson N. (1998)	-	504	-	Start-ups	Questionnaire	33%	Founder(s)	Firm	SPSS/PC+, multivariate analysis	1989-1993
Success Factors in New Ventures: A	Song, M., Podoynitsyna, K., Bij, H., Halman, J. (2008)	United States	106	NTV's (new technologic ventures)	Start-ups	Research studies	29%	-	Firm	Meta-analysis	1991-2000

Meta-analysis											
SME-oriented implementation of a performance measurement system	Tenhunen, J., Rantanen, H., Ukko, J. (2001)	Southern Finland	3	Industrial firms	SME's	Workshops	100%	Executive board	Firm	Case studies	2000-2001
Theory and practice in SME performance measurement systems	Hudson, M., Smart, A., Bourne, M. (2001)	-	-	-	SME's	Semi-structured interviews, workshops	-	Manger(s) of SME's	Firm	Case studies	-

Table 8. Methodological aspects of the similar studies

3. Research Goals and Methodology

This chapter describes the methodology adopted in the present study. In section 3.1. the hypotheses of the investigation are cleared stated and exemplified. In section 3.2., the research methodology is exposed. By its turn, in section 3.3, the population and sample are defined and the cases study are described. In section 3.4., it is explained how the data was collected and the dependent and independent variables are defined. Finally, in the 3.5. section, the data that were collected is processed, analysed, and interpreted in order to prepare to discuss the main obtained results.

3.1. Hypothesis of the investigation

Based on the literature review that was made, the following model of investigation is suggested (figure 16), to analyse the importance of the selected factors on the success of the start-up as well as the indicators mentioned in the literature that are the most suitable to measure the performance of the start-ups.

Two different hypotheses of investigation were developed:

Hypothesis 1: The identified success factors in the literature review contribute to the success of the selected start-ups? These success factors are applicable to the start-ups in the health area in particular? The identified success factors are enough to conclude about the success factors in start-ups? Which other ones should be included?

Hypothesis 2: The identified performance indicators in the literature review contribute to the performance measurement of the selected start-ups? These performance indicators are applicable to the start-ups in the health area in particular? The identified performance indicators are enough to evaluate about the performance of the start-ups? Which others can be used?

Through this two research questions, this investigation aims to contribute to a better understanding of the most relevant factors that contribute to the achievement of the success at the start-ups in the health sector and to understand as well what are the most suitable indicators to measure the performance of start-ups in the health sector.

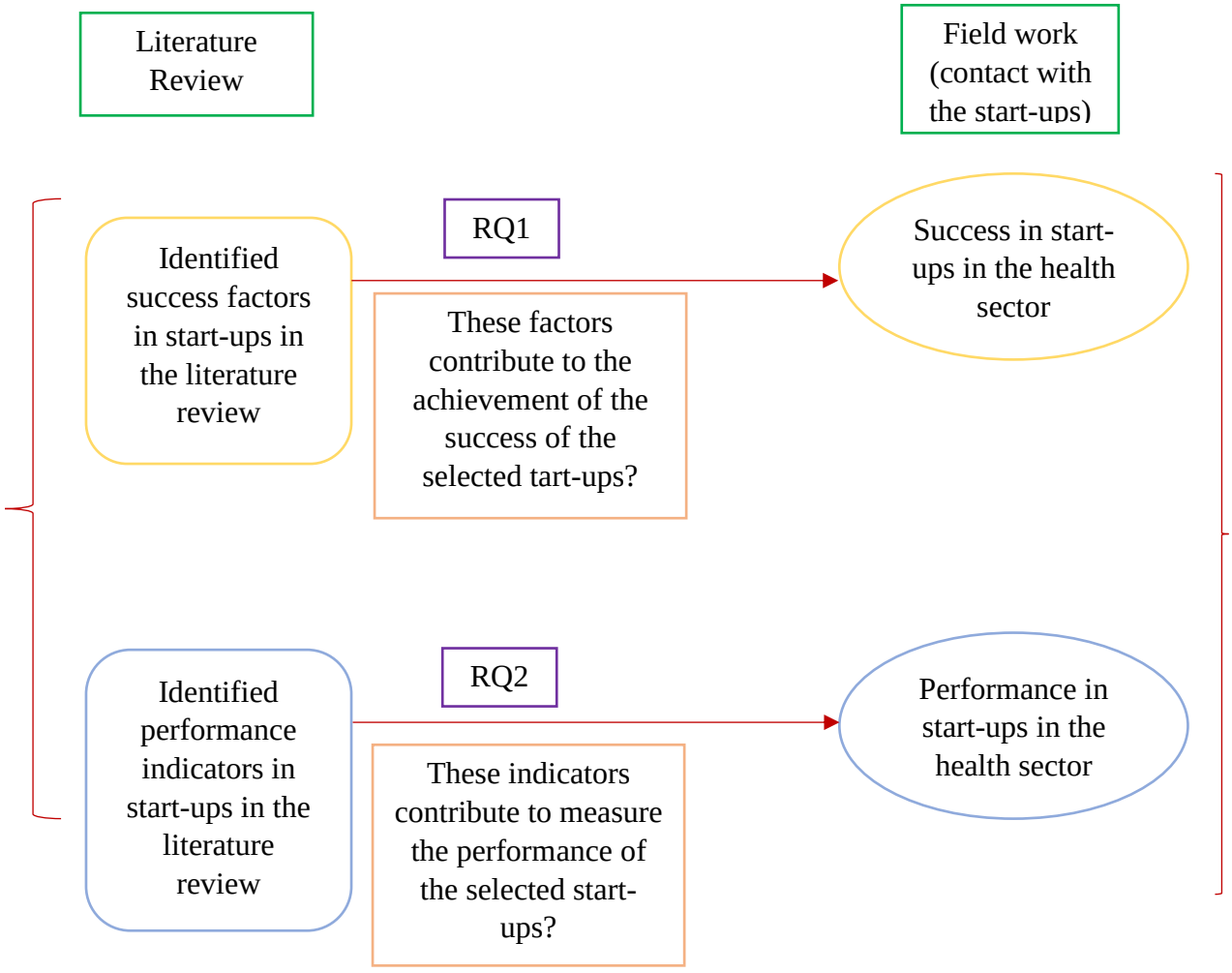


Figure 16. Model of investigation

This model is designed with two objectives. First, it intends to analyse and conclude, through a fieldwork involving some start-ups, about the factors that contribute to the success of start-ups in the healthcare area, among the ones analysed in the literature review.

Secondly, it intends to analyse, through a fieldwork with some start-ups, the indicators that are more suitable to measure the performance of the start-ups in the healthcare sector, among the ones analysed in the literature review.

Moreover, it intends to conclude about the sufficiency of the selected success factors and performance indicators and suggest others to include in the study.

3.2. Research Methodology

In this research, the choice of a case study methodology seems suitable because as stated by Yin (2003), cited in Vorontsova (2016), "The case study method allows investigators to retain the comprehensive and meaningful characteristics of real-life events". In this study, this is a relevant methodology to adopt, being suitable to explore the start-ups' complex interventions, the relationships, and the programs.

Still according to Yin (2003) cited in Vorontsova (2016), case studies are applicable when the questions that the research intends to answer are in the scope of "Why?" and "How?". Following that logic, the research questions of this study match with the case methodology. Besides that, and as stated by Hyett *et al.* (2014), the case study method is becoming progressively more popular among researchers.

The multiple case-study was chosen, having the possibility to do both analysis: analysis within-case and cross-case data.

In the use of multiple case studies the use of qualitative methods are more suitable than the quantitative ones to effectively answer to questions such as: "Why?", "How?", "Where?", "Who?" or "What?" and to deeply analyse the information. (Gustafsson, 2017).

To collect the data, in-depth interviews and a questionnaire were done. The in-depth interviews are a good method to avoid misinterpretations of the phenomena that can occur in situations of close-end questions. The interviews and the questionnaires were directed to the founders or actual managers of the chosen start-ups. Overall, the set of the methodological aspects are resumed in the following table (table 9).

Research Strategy	Data collection method	Analysis Method	Approach	Perspective
Multiple-case study	In-depth interviews & questionnaire	Qualitative content analysis	Deductive Approach	Theory-guided analysis

Table 9. Methodological aspects applied in the study

In the following table 10), a different methodology analysis can be applied, in concordance with the methodology analyse applied in the similar studies.

Country of analysis	Sample size	Business sector	Company typology	Collection of Data	Answer rate	Key informer	Unit of analysis	Statistical analysis	Period of analyse
Portugal	18	Health sector	Start-up	Questionnaire, interviews	33 %	CEO's/founders of the company	Firm	Case-study	2017

Table 10. Methodological aspects of the dissertation

3.3. Population and sample – Cases Selection

Concerning the objective of the study, there were selected start-ups in different stages of its development, some of them in the embryonic phase, while others in the start-up phase. Additionally, once the desired sector to study was the health sector, only health start-ups were included in the study.

Creating a definition for Health Tech is complex, considering the several dimensions that the health sector includes, with its endless set of possible uses for technology and the various operations, services and stakeholders that can be involved. (Plug and Play, 2016). According to Gibbons (2011), entrepreneurs that understand healthcare trends and consumer demands are leading creative business start-ups that are developing health-

oriented social networks, health content aggregators, medical and wellness applications and tools to enable the investigation on a specific health area.

On an investigation work, it is essential the definition of the population on which the study will focus. According to Fortin (1999) cited in Ferra (2013), the population includes people, groups and objects with common characteristics, on which factors according to the present study are established.
In this investigation, the considered population are the start-ups in the health sector that exist in Portugal.

In the same line, Fortin (1999) cited in Ferra (2013), refers that the sample is a part of the population, that was chosen with the objective to collect information about the topics to be investigated in a way that the entire population is conveniently represented. From the information collected about each company on the UPTEC - *Parque de Ciência e Tecnologia da Universidade do Porto* website, eighteen (18) start-ups related to the health area, in a direct or indirect mode of their business activity were selected. So, in this investigation, the sample was constituted by all the start-ups (18) operating in the health sector installed at UPTEC. These start-ups were all selected independently of their business size and their location in one of the poles of UPTEC.

The health sector start-ups of UPTEC are a sample that represent on an effective way the population once UPTEC is one of the main and credible aggregator centres of start-ups and entrepreneurs in Portugal. According to the last data of 2016, in UPTEC are installed 167 business projects and 88 companies are incubated. (UPTEC, 2013).

The eighteen selected start-ups were: Adapt Tech, Adjust Consulting, Biognosis, EACT, EasyDiet, GRiSP, Health Insight, HealthySystems, Inovapotek, Knok, LabOrders, Moldaro, ScanSci, Sphere Ultrafast Photonics, STAB VIDA, SurgeonMate, Vitacontrol and Wymbe. EasyDiet, Wymbe, Moldaro, EACT, SurgeonMate and Knok were selected to schedule an interview with the entrepreneurs. EasyDiet was not interested in collaborating in this part of the project, from Wymbe no response was collected and EACT was not available at the moment to collaborate. So, SurgeonMate, Moldaro and Knok were the ones interested in participating in this request.

This information is synthetized in the following table (table 11 and 12) respecting some of the main information's about each start-up company that was involved in the questionnaire and in the case study.

Start-ups present in the questionnaire and in the case-study

Nº	Name	Business Description	Year of inception	Lifecycle Stage	Size (nºof employees)	Founder Gender	Financing type	Academic qualifications of the founder	Sub-sector of industry
1	SurgeonMate	Development of products that aim to improve the performance of the cirurgeons.	2015	Embrionic phase	3	Male	Private Equity	Post-graduate	Surgery
2	Moldaro	Production and commercialization of medical footwear to people with sequelae of chronic diseases	2015	Start-up phase	2	Male	Private Equity	Post-Graduate	Medical footwear
3	Knok	Online platform that allows for virtual appointments between the doctors and the users	2015	Start-up phase	6	Male	Private and External Equity	Post-Graduate	Medical appointments

Table 11. Start-ups present in the questionnaire and in the case-study

Start-ups only present in the questionnaire

Nº	Name	Business Description	Year of Inception	Lifecycle Stage	Size (nº employees)	Founder Gender	Academic qualifications of the founder	Sub-sector of industry
1	EasyDiet	Software related to the nutrition and fitness area	n.a.[1]	Embrionic phase	8	Male	MBA	Nutrition and fitness
2	VitaControl	Development of kits to detect infectious diseases	n.a.[2]	Start-up phase	2	Female	PhD	Infectious Diseases
3	Hubit	App operating in the Healthy Lifestyle sector	2013	Start-up phase	5	Male	Graduation	Healthy lifestyle

Table 12. Start-ups only present in the questionnaire

As it is possible to state by the previous tables, each start-up develops its own technology, service or product associated to the health sector.

The sample is diverse and allows to analyse the collected data according the research questions.

[1] n.a. – not answered
[2] n.a. – not answered

3.4. Collection of the data and definition of the variables

Fortin (1999) cited in Ferra (2013), defends that the collection of data requires the utilization of instruments that depend on the variables used in the study and its respective operationalization. In accordance to the purpose of this investigation, the knowledge about the variables, the acquisition of the suitable measures to the conceptual definitions, a questionnaire and semi-structured in-depth interviews were used. An in-depth interview is a technique used in qualitative research that implies individual interviews with a small number of respondents to gather their attitudes towards a particular idea or project. (Boyce & Neale, 2006 in Vorontsova, 2016).

According to Boyce and Neale (2006) in Vorontsova (2016), such interviews are suitable when the detailed information about a respondent's thoughts and behaviour is required to obtain a more complete understanding of what happened in the project and the reason why it happened.

Balancing the two used instruments, in-depth interviews and the questionnaire, it is possible to conclude that interviews are less structured than questionnaires. Interviews are more flexible and adaptive to the interviewee's answers. On the other hand, the questionnaire can be applied to a big sample, guarantees the anonymity of the answers, the statistical treatment of the data and the possibility to cross variables and answers on a simple way and the post elaboration of the conclusions. Thus, the combination of both is the perfect match for this study.

This methodology is one of the most used ones in the social sciences. In the case of this dissertation, the questionnaire that was developed is the instrument of the analysis that will enable to achieve some conclusions in this dissertation.

According the literature review, it was elaborated and applied a questionnaire (totally present in the appendix number 1), through an online platform – Online Pesquisa, during one month – from 04 July to 03 August of 2017. This questionnaire was made with personalized links and codes that controlled the answers. From the eighteen (18) start-ups that were contacted, a total of six (6) questionnaires were answered, creating an answer rate of 33,33%. Besides the six (6) questionnaires, three (3) interviews were realized with the entrepreneurs, one round for each start-up. All respondents are in the founder's group of the start-up and fit in the CEO position in the company and all of them were involved in the creation of the project since the beginning until the actual stage of the interview. The interviews were done between 19 and 24 July. All interviews took place in Porto, Portugal. The interview with the SurgeonMate entrepreneurs occurred on the skype online platform through a video call. All the interviews lasted around 1h30. Additional resumed information about the interviews can be found in the following table (table 13).

Nº	Start-up name	Respondent´s name	Respondent´s position in the start-up	Interview Date	Interview Place	Interview Duration
1	SurgeonMate	Nuno Muralha	CEO, founder	19 July	Porto, Skype online platform	1h20
2	Moldaro	João Amaro	CEO, founder	20 July	Porto, *Hospital São João*	1h15
3	Knok	José Bastos	CEO, founder	24 July	Porto, *Pólo UPTEC Mar*, Leça da Palmeira	1h35

Table 13. Interviewee's characteristics

As it was previous mentioned, these interviews were realized on a semi-structured way, which means that besides the already elaborated questions, there was the possibility to include more questions if it was pertinent with the course of the interview. Some of the main questions were about the creation of the project and the evaluation of the answered questionnaire, to collect the entrepreneur' opinion about the several topics present in the questionnaire. Besides that, when pertinent, some other questions were added, such as: "Which advices are pertinent to transmit to future willing entrepreneurs?". These questions were elaborated having in mind the observation of the attitudes and behaviours of the entrepreneurs. The questions were organized following the logic of the questionnaire elaboration: first the questions corresponding to the first part of the questionnaire – start-up and entrepreneur characterization, then corresponding to the second – success factors and finally corresponding to the third – performance indicators. If by some reason, the respondent did not answer clearly to the asked question, additional questions were made to collect the desired answers and information. The resume of the

interview script connected with the research questions can be visualized in the following table (table 14).

Section	1- start-up and entrepreneur characterization	2- success factors	2- success factors	3- performance indicators	3- performance indicators
Purpose	Investigate more about the project	Validate the success factors for the start-ups in the health sector	Validate the sufficiency of the researched success factors	Validate the performance indicators for the start-ups in the health sector	Validate the sufficiency of the researched performance indicators
Question	"How the project of the start-up can be descripted? How the idea was developed?"	"Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each success factor?"	"Which other success factors are relevant to include in the questionnaire?"	"Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each performance indicator?"	"Which other performance indicators are relevant to include in the questionnaire?"
Research Question	n.a.[1]	1	1	2	2

Table 14. Interview script and respective match with the research questions

As it was mentioned in previous sections of this chapter, the selected sample was the eighteen (18) start-ups installed at UPTEC in the health sector. The objective of the interaction with the start-ups was the following: first ask their enrolment in the questionnaire (in this phase 6 of them acceded to the request) and by a complementary perspective, some of them were chosen

[1] n.a. – not applicable

to collaborate on personal interviews to analyse on a deepest mode the questionnaire and the activity of the start-up (allocated to this part were 3 start-ups).

All the eighteen (18) start-ups were in first instance contacted by email, framing the situation and asking for their participation. After that phase, and due to the low response rate of them to the email and to the questionnaire, all of them were contacted by phone call asking for their involvement on the study. After this step, some of the start-ups committed to answer to the questionnaire. Then, later, the chosen ones to the personal interviews were contacted again and the interviews were schedule.

Variables Definition

To ensure an accurate result on a scientific investigation, it is important the definition of variables. Fortin (1999) cited in Ferra (2013), characterizes the variables as qualities, property of objects, persons or situations that are involved in an investigation. So, the dependent variable is defined, according this author, as that one that reacts and manifests the expected effect of the independent variable. It means that it is the result and answer of the presence of the dependent variable. In this study, the dependent variables are the success in the start-ups of UPTEC in the health sector and the evaluation of the performance at these start-ups.

On the other hand, an independent variable is defined by Fortin (1999) in Ferra (2013), as the influencing variable of the dependent variable because in a research, the independent variable is manipulated, in such a way to measure the effect that it exercises in the dependent variable. In this investigation, the independent variables are the thirty-four (34) success factors that were identified in the literature review as success factors for the start-ups and the fourteen (14) performance indicators that were identified in the literature review as the ones that correctly measure the performance at start-ups. These independent variables are correctly exemplified on the following tables 15 and 16.

In the table 13, the success factors identified in the literature review that will be analysed in the start-ups of the health sector at UPTEC are listed. The table exposes in a graphic way each success factor formulated by its author in order to acquire a graphic view.

Factor	Success factors	Author(s)
F1	Access to pertinent information	Halabí and Lussier (2014)
F2	Manager management experience	Halabí and Lussier (2014); Konno (2015)
F3	Manager industry experience	Halabí and Lussier (2014)
F4	Balanced finances	Konno (2015); Lafuente et al. (2013)
F5	Good control and planning	Halabí and Lussier (2014)
F6	Access to good Mentoring	Halabí and Lussier (2014); Paoloni and Dumay (2015); Omri et al. (2015); Allen (2016)
F7	Marketing & Communication	Halabí and Lussier (2014); Lafuente et al. (2013); Chittithaworn et al. (2011)
F8	Effective team work	Halabí and Lussier (2014); Omri et al. (2015); Paoloni and Dumay (2015)
F9	Inexistence of competitors/substitute products	Ferra (2013)
F10	Differentiation of the product/service	Konno (2015)
F11	Knowledge and capabilities of the staff	Konno (2015)
F12	Adaptability skills	Konno (2015)
F13	Location of the start-up	Allen (2016)
F14	Family support and integration in the start-up management	Michiels (2017); Al-Mahrouq (2010)
F15	Entrepreneurial capabilities	Lewrick et al. (2011)
F16	Internationalization	Lafuente et al. (2013)

F17	Founder's positive influence	Harris and Ogbonna (1999)
F18	Economic Sustainability	Lafuente et al. (2013)
F19	Development of Innovative Products	Adam and Skyes (2003); Omri et al. (2015); Lewrick et al. (2011); Lafuente et al. (2013)
F20	Development of New technologies	Adam and Skyes (2003); Omri et al. (2015); Lewrick et al. (2011); Lafuente et al. (2013)
F21	Ownership of Intellectual Property	Chu and Andreassi (2011)
F22	Establishment of Strategic partnerships	Adam and Skyes (2003); Halabí and Lussier (2014)
F23	Good price/quality ratio	Chu et al. (2011)
F24	Deep study and knowledge of the marketplace	Chittithaworn et al. (2011)
F25	Access to European and national funds	Mason and Harrison (2006)
F26	Access to investors	Mason and Harrison (2006)
F27	Continuous training	Al-Mahrouq (2010)
F28	Regulatory issues	Baganha;Health Cluster Portugal;Sistema Nacional de Saúde (SNS)
F29	Government impact	Majava et al. (2016); Health Cluster Portugal
F30	Gender	Klyver and Grant (2010)
F31	Academic qualifications	Kropp et al. (2008)
F32	Manager's age	Konno (2015)
F33	Age of the business	Halabí and Lussier (2014)
F34	Size of the firm	Halabí and Lussier (2014); Lewrick et al. (2011)

Table 15. Success factors applied in the questionnaire

In table 16, the performance indicators identified in the literature review that will be analysed in the start-ups of the health sector at UPTEC are listed. The table exposes in a graphic way

each performance indicator formulated by the respective author to experience a practice visualization.

Indicator	Performance Indicator	Author(s)
I1	Number of units/products/services produced	Saunila (2017)
I2	Number of registered patents	Saunila (2017)
I3	Number of customers	Saunila (2017)
I4	Entry in new markets	Saunila (2017)
I5	Sales Volume	Saunila (2017)
I6	Profits	Saunila (2017)
I7	Financial performance	Saunila (2017)
I8	Customer Satisfaction	Spillan and Parnell (2006)
I9	Negotiation power towards the stakeholders	Ferra (2013)
I10	Delivery within the agreed timeframe	Ferra (2013)
I11	Few amount of bureocracy	Smith M. and Smith D. (2006)
I12	Staff satisfaction	Beaver (2003)
I13	Accomplishment of the targeted goals for the start-up	Beaver (2003)
I14	Rounds of Investment	Pun and Hosein (2007)

Table 16. Performance indicators applied in the questionnaire

The questions developed in the questionnaire to classify the importance of each factor in the achievement of success of the start-up and the indicators in the evaluation of the performance of the start-ups were developed in a Likert scale of five points. In the case of the success factors the number 1 represents “Nothing important at all” and the number 5 represents “Very

important". In the case of the performance indicators, the number 1 represents "Not suitable" and the number 5 represents "Totally Suitable".

According to Hartley (2013), there are several advantages of using this type of scale. It allows a widely and standardized method to classify the samples, it is suitable to classify large samples, increases the validity of the findings and sub groups can be meaningfully compared. In this case, the fact that the Likert scale goes from 1 to 5 points, it allows the selection of a medium classification using the number 3 to classify.

3.5. Data analysis

3.5.1. Deductive Approach and Statistical Considerations

As stated by Snieder (2009, pp.16) in Vorontsova (2016) the data analysis is executed through a deductive approach when "research questions explore a known theory or phenomena and tests if that theory is valid in given circumstances". The applicable investigation process in a qualitative approach is exemplified as follows in the scheme presented by Mayring (2000) and it is represented in the following figure (figure 17).

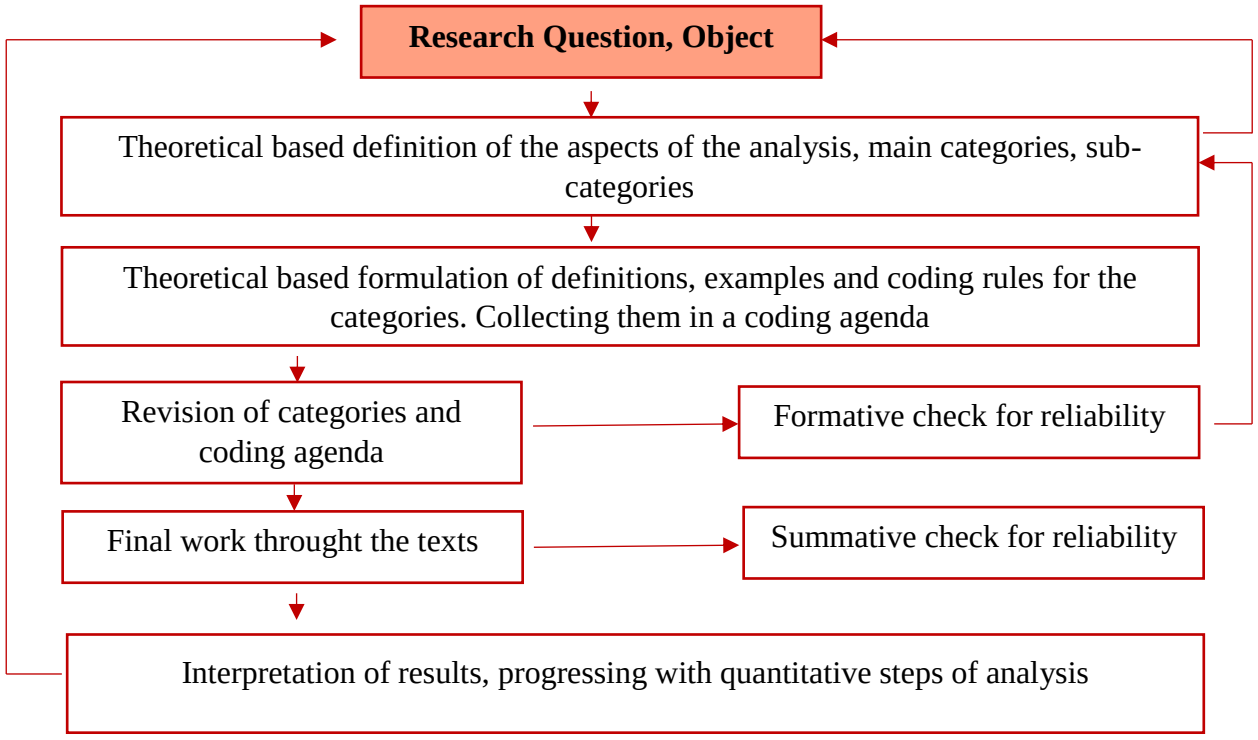


Figure 17. Detailed model of deductive category application

The main idea of this scheme, and interconnecting it with this investigation, is to transform the main analysis executed in the theory, literature review and concepts definition into the text conclusions of the study. This process is achieved through the data collection, the analysis of the data and the encodings that are processed during this process. In this investigation, the encodings are the frequencies that will allow to synthetize each success factor and performance indicator to acquire a global view of the topic. The objective is to categorize and highlight the common factors in the same category. Another objective of the deductive model is to allow the researcher in the end of the study to transform the collected information into objective and quantitative indicators, such as frequencies and averages.

After the collection of the data, with the objective to be properly processed, and having into account the small amount of collected data and the qualitative nature of the data, data was analysed in the programme where the questionnaire was developed – Online Pesquisa.

According to Ferra (2013), the applicable methodology in the analysis of the results should follow the objectives and draw of the investigation. Having that in mind, with the objective to describe and resume the aggregated data that was collected descriptive statistics here done. This method targets several numeric data, mainly through absolute and relative frequencies, as well as the average and the standard deviation.

3.5.2. Start-ups' data collection – the questionnaire

Relating to companies' contacts, Adapt Tech, Adjust Consulting and Biognosis are present in the website of UPTEC as start-ups incubated by UPTEC. However, the direction of UPTEC represented by Mrs. Marta Sistelo, confirmed that Adapt Tech, Adjust Consulting and Biognosis already achieved the graduated stage at UPTEC and they were not anymore installed and developing its activities in UPTEC centre. Currently, they are established and operating by their own. These companies were contacted several times with the aim to collect their feedback about their presence at UPTEC, what were the main advantages and disadvantages and what lead them to succeed proportionating to move out from UPTEC incubation centre. However, no answer was collected from them.

In the interpretation of the developed questionnaire it is important to state that in this dissertation, the questionnaire represents a double objective: it is the means and the purpose as well. It is the means that will allow to get to further studies focus on the construction of a

formula that evaluates the performance of the start-up. It is the purpose because it represents a major purpose of this dissertation – the analyse of the universe of the health start-ups and the conclusion about the importance of the selected success factors and performance indicators.

The following scheme organizes the start-ups by its participation in this study (table 17).

Start-up Name	Graduated start-ups	Personal Interview	Answered to the questionnaire	Did not answered to the questionnaire
Adapt Tech	X			
Adjust Consulting	X			
Biognosis	X			
EACT				X
EasyDiet			X	
GRiSP				X
Health Insight				X
HealthySystems				X
Inovapotek				X
Knok		X	X	
LabOrders				X
Moldaro		X	X	
ScanSci				X
Sphere Ultrafast Photonics				X
STAB VIDA				X
SurgeonMate		X	X	
Vitacontrol			X	
Wymbe			X	

Table 17. Interaction with the chosen start-ups

3.5.3. Case Studies - SurgeonMate, Moldaro and Knok

Next, some of the main topics of the interviews will be highlighted. However, the full interviews to each one of the entrepreneurs are shown in the appendix number 2.

3.5.3.1. SurgeonMate case study

The SurgeonMate' interview occurred through skype online platform and the entrepreneur representing the start-up was Dr. Nuno Muralha – the founder and general surgery surgeon.

SurgeonMate dedicates its activity to the development of products that can improve the performance of surgeons.

Dr.Nuno Muralha explained that the project of the SurgeonMate is in the development and test phase and it is not yet commercialized in the market.
Dr.Nuno consider extremely important the factors related to the knowledge and commitment of the staff. The factors that were more highlighted were the excellence and motivation of the team that works on the project as well as the belief, passion and persistence during the different stages of the start-up. In its opinion, the performance of the start-up should not be measured in sales but in the accomplishment of the targeted goals for the start-up. This opinion is in agreement with the opinion of the author Halabí and Lussier (2014) present in the literature review that argues that success should be measured in according to the start-up own objectives and not through a standard indicator.

3.5.3.2. Moldaro case study

The face to face meeting with Moldaro occurred in the installations of São.João' hospital in Porto and Moldaro was represented by the founder Dr. João Amaro that actually works in the Serviço Ocupacional at São João' hospital. Moldaro is located at the biotechnology pole and it is a start-up that initially was dedicated to the production and commercialization of medical footwear to people with sequelae of chronic diseases. Nowadays, for several reasons, they are no longer committed with the project of the medical shoes and Moldaro is dedicated to the provision of clinical services in the area of rehabilitation.

One of the main factors why Dr.João considers that the project did not go ahead was the fact that initially the founders focused and invested too much time and resources in the development of the product and they minimize the market demand and dimension and the communication of the product. The result of these decisions was that the price was too high considering the competitors' products, which affected the commercialization of the product. The deregulation of the market was another factor mentioned by the entrepreneur that harmed the project.

Dr.João considers that it is important to contact with installed companies in the market before start to deeply invest in the product.

3.5.3.3. Knok case study

The third interview was related to Knok, represented by the founder Dr.José Bastos. The interview occurred in the installations of "UPTEC – Pólo do Mar", at Leça da Palmeira.
Knok is dedicated to the development of an online platform that provides virtual appointments between the doctors and the users of the service. The objective of this project is to increase the efficiency of the medical services that are provided and to personalize the interaction between the doctors and the users.

Dr.José Bastos, shared his opinion: customers' needs and satisfaction must prevail over financial performance at the beginning of the activity of the start-up. Furthermore, the entrepreneur considers the hard work to achieve the desired results crucial. Through some economic studies, he developed the idea that the success of the project is proportional to the number of hours that the entrepreneurs work on the project. So, he exalted factors such as the suffering capacity and the persistence that are needed to lead the project to a successful stage.

3.5.3.4. Common ideas

All the entrepreneurs agreed that the most important success factors and performance indicators were contemplated in the two main questions of the questionnaire. Despite that, Dr.Nuno Muralha, founder of SurgeonMate, consider that humility and good luck are important factors to succeed as well.

All the interviewed start-ups highlighted the extremely importance of UPTEC in the development of their projects in terms of mentoring and specific formations (management concepts, communication of the product and marketing, for example). They consider that the project would not be so well succeed without the support provided by UPTEC. It is common to verify that often, these entrepreneurs own the technical competences about the project but not the management competences to manage the start-up and this is one of the parts where UPTEC can be extremely important. This aspect cannot be neglected and it is fundamental for the development of the product or service.

3.5.3.5. Deeply in the success factors

From the interviews developed with the entrepreneurs of SurgeonMate, Moldaro and Knok, it was possible to analyse in a deeper mode some of the main success variables identified in the literature review. About the regulatory issues, as it was discussed previous in the literature review, the health sector is highly controlled by governmental and institutional entities (Baganha). However, in some areas, the regulatory issues are more present in the theory than in the practice, originating unfair competition as stated by Moldaro entrepreneur. In the conversations with these entrepreneurs, all of them mentioned the importance of the establishment of strategic partnerships and the creation of a solid network with the right partners for the business. About the adaptability skills, entrepreneurs refer that it is crucial to have the capacity to fit in the different circumstances and to develop the persistence that is needed in the several phases of the project, particularly when the path is turbulent. A common and well discussed factor is the importance of the team and the staff that works in the project. All of them mentioned the extremely importance and contribution of the team in the accomplishment of the targeted objectives. Entrepreneurs recognize that consumers want something that surprise them and that adds value to something that already exists in the market. This is what these start-ups are constantly trying to do. And in this scope the differentiation of the product is vital to the success. About the good control and planning of the several activities of the start-up, entrepreneurs consider it is vital and transversal to all the areas of the start-up going from the budget to the staff. Finally, access to pertinent information is crucial to manage efficient contracts in the business. As it is well known, information is power and power is what these start-ups need to achieve the success.

3.5.3.6. Deeply in the performance indicators

From the conversations established with the entrepreneurs from SurgeonMate, Moldaro and Knok, some conclusions will be stated in the following paragraphs about the performance indicators.

About the number of registered patents, Moldaro pronounced that despite the work is done on an innovative, sometimes patents are overvalued. More important than create some product that can be patented, it is crucial to create something that the customer validates otherwise it remains in the sphere of the development of the concept, the research and the development of the idea but it does not reach the product commercialization phase that is the objective of these entrepreneurs. Entrepreneurs consider that it is important to operate with a strong negotiation power vis-a-vis the stakeholders. This performance indicator is related with the flexibility that several times start-ups need to operate in their daily operations helping them to manage its operations, towards the customers, the government and the suppliers. A common and strong performance indicator that is present in the entrepreneur's answers is the focus in the customer (more than in the financial part of the business). The indicators number of customers and customer satisfaction were strongly highlighted in the answers of the entrepreneurs. This happens because start-ups are in the beginning of their business and they really need the approval of the costumers to pursue its activities. Sometimes, in the beginning it is more important to capture loyal customers, publish the product into the market, communicate it, promote it and enter in the market than control and balance the finances of the start-up. Several times, in the beginning, entrepreneurs need and prefer to allocate private capital to the project than apply for external investors or bank loans. By acting like this, the financial part is more controlled when compared to the situation when entrepreneurs are subjects to investors pressure. The delivery within the agreed timeframe is important because it is related to the commitment that these start-ups need to establish with the customers in this earlier stages of the business. A trust relationship is something that grows with time and constant actions and this is exactly what start-ups need to prove to their customers.

3.5.3.7. Conclusion

The main 2 ideas that can be extracted from the in-depth interviews with entrepreneurs are: 1) in the first research question, about the success factors, entrepreneurs mentioned the importance and relevance of the team that works on the project to succeed; 2) in the second

research question, about the performance indicators, the prevalence of the customer indicators over the financial ones in the evaluation of the start-up performance.

The findings of the research are presented and discussed in the following chapter, chapter four (4).

4. Results and Discussion

This chapter discusses the main findings of the investigation that contribute to complement the theoretical background already discussed in the chapter of the literature review. Thus, it includes three sections, organized around text, tables and figures in order to clearly answer to the proposed research questions and graphically present the main results of the investigation. Some discussions on the key themes about success factors, performance indicators and effective means to evaluate start-ups are addressed in this section too.

4.1. Statistical analysis - sample characterization

In this chapter the following statistics will be presented: respecting to the gender of the entrepreneurs of the studied start-ups, it is notorious that the most part is male (83,33%) what meets the conclusions in the Klyver and Grant (2010) study. All the entrepreneurs are both the founders and the managers of the businesses, what is a common situation in this type of organisations. Concerning the academic qualifications, half of the entrepreneurs are post-graduate, and the other half is equally distributed by the categories: graduation, PhD and MBA. These findings are concordant with the literature review statements about the academic qualification of the entrepreneurs. Halabí and Lussier (2014) argued that "business owners have a higher level of education". Finally, about the age of the entrepreneurs, it is possible to observe that the most part are in the age between 30 and 40. These statistics can be graphically found in the following tables (table 18,19,20 and 21).

Gender	Nº	%
Male	5	83,33%
Female	1	16,66%

Table 18. Characterization of the entrepreneurs by its gender

Academic Qualifications	Nº	%
4ºyear	0	0%
9ºyear	0	0%
12ºyear	0	0%
Professional Course	0	0%
Graduation	1	16,66%
Post-Graduation	3	50%
Master	0	0%
PhD	1	16,66%

MBA	1	16,66%
Other	0	0%

Table 19. Characterization of the entrepreneurs by its academic qualifications

Position in the company	**Nº**	**%**
Founder	0	0%
Manager	0	0%
Both	6	100%

Table 20. Characterization of the entrepreneurs by its position in the company

Age	**Nº**	**%**
30-40	4	66,66%
40-50	2	33,33%

Table 21. Characterization of the entrepreneurs by its age

About the inquired start-ups, they can be characterized by its year of creation (inception), its business volume and its dimension measured in number of workers, present in the table 22, 23 and 24. As it is possible to conclude by the analysis of the data, the most part of the inquired start-ups (66,66%) are micro start-ups (<5 persons working on the project). Often, in this type of projects, it is only a person or a pair of them, that develops and works in the company, sometimes in partial time, others in full time. Related to the year of creation of the start-up, and as it was previously mentioned, the targeted start-ups are yet in the incubation phase or are in the start-up phase. These are the two beginning phases of the start-ups, what it means that the start-ups are young yet. Half of the 6 (50%) have 2 years of activity. Finally, and according their business volume, unfortunately it is not possible to extract relevant conclusions because the most part of the start-ups did not answer to this question (66,66%). This is an information that several times companies are reluctant to reveal.

Dimension	**Nº**	**%**
1 -5	4	66,66%
5- 10	2	33,33%

Table 22. Characterization of the start-up by its dimension

Year of creation	Nº	%
2013 (4 years)	1	16,66%
2015 (2 years)	3	50%
n.a.[2]	2	33,33%

Table 23. Characterization of the start-up by its year of creation

Business Volume	Nº	%
50.000€	1	16,66%
100.000€	1	16,66%
n.a.[3]	4	66,66%

Table 24. Characterization of the start-up by its business volume

4.2. Success Factors and literature review

The following table (table 25), displays the success factors by the author and by the answer of the entrepreneurs in the questionnaire. It will allow to extract some of the main conclusions about the questionnaire as well as interconnect the conclusions of the questionnaire with the conclusions of the literature review about the success factors.

[2] n.a. – not answered

[3] One of the start-ups that didn't answered to this question explained that once the start-up is not yet in the commercialization step, it is not possible to register the revenues.

	Halabí and Lussier (2014)	Konno (2015)	Lafuente et al. (2013)	Omri et al. (2015)	Paoloni and Dumay (2015)	Ferra (2013)	Allen (2016)	Michiels (2017)	Lewrick et al. (2011)	Harris and Ogbonna (1999)	Adam and Skyes (2003)	Chu and Andreassi (2011)	Chu et al. (2011)	Chittithaworn et al. (2011)	Mason and Harrison (2006)	Al-Mahrouq (2010)	Baganha	Health Cluster Portugal	Sistema Nacional de Saúde (SNS)	Majava et al. (2016)	Klyver and Grant (2010)	Kropp et al. (2008)	Total	Questionnaire
Good Control and planning	x																						1	5
Effective team work	x			x	x						x												3	5
Differentiation of the product/service		x																					1	5
Knowledge and capabilities of the staff		x																					1	5
Adaptability skills		x																					1	5
Establishment of Strategic partnerships	x										x												2	5
Access to pertinent information	x																						1	4
Entrepreneurial capabilities									x														1	4
Founder's positive influence										x													1	4

Development of Innovative Products			x	x					x		x											4	4
Deep study and knowledge of the marketplace														x								1	4
Regulatory issues																	x	x	x			3	4
Access to good Mentoring	x			x	x		x															4	3
Marketing and communication	x		x											x								3	3
Internationalization			x																			1	3
Economic Sustainability			x																			1	3
Ownership of Intellectual Property												x										1	3
Good price/quality ratio													x									1	3
Continuous training																x						1	3
Manager management experience	x	x																				2	2
Balanced finances		x	x																			2	2
Family support and integration in the start-up management								x								x						2	2
Access to investors															x							1	2
Manager industry experience	x																					1	1

Location of the start-up							x																1	1
Development of New technologies			x	x					x		x												4	1
Access to European funds															x								1	1
Government impact																		x		x			2	1
Inexistence of competitors/substitute products						x																	1	0
Gender																					x		1	n.a
Academic qualifications	x																					x	2	n.a
Manager's age		x																					1	n.a
Age of the business	x																						1	n.a
Size of the firm	x								x														2	n.a
Total	11	6	6	4	2	1	2	1	4	1	3	1	1	2	2	2	1	2	1	1	1	1	56	

Table 25. The success factors and literature review

The above table interconnects the authors, the topics and the questionnaire results. From the table, it is possible to extract some conclusions about the success factors of start-ups in the health sector. Considering that 6 start-ups answered the questionnaire, it is possible to conclude about the factors that the most part of the entrepreneurs consider crucial for the success of their businesses.

The variance of the classification is notorious – some start-ups only highlighted with the maximum level (level five) three (3) success factors of twenty-nine (29), while others highlighted nineteen (19) of twenty-nine (29).

The factors classified with the number 5 and above the average calculated by the program (4,33) are: good control and planning, effective team work, differentiation of the product/service, knowledge and capabilities of the staff, adaptability skills and establishment of strategic partnerships. It is concordant with the conclusions in the literature review about the success factors. Halabí and Lussier (2014), extolled the importance of the good control and planning in terms of budget and team in order to succeed. As stated by Omri et al. (2015), effective team work and by its turn knowledge and capabilities of the staff are important because it allows innovation that is crucial to succeed. Konno (2015), focus its analyse on the uniqueness of the product through the VRIO framework as an important factor to succeed. Still in Konno (2015), it is possible to conclude that the findings meet the author's literature about the adaptability skills that are required to adapt to a constantly internal and external changing environment. Finally, the establishment of strategic partners is pointed out by Adam and Skyes (2013), as one of the crucial factors connected to the innovation: strategic partners can be important in the development of new products and integration of new technology.

By its turn, the factors that acquire low classification (level 0 and 1), are: Inexistence of competitors/substitute products, government impact, access to European funds, the development of new technologies, the location of the start-up and the manager industry experience. In this section, clearly prevail the factors related to the team knowledge and the commitment of the staff. As well, it is relevant to notice what are the success factors that the most part of the entrepreneurs (3 start-ups) consider on an indifference level (level 3): location of the start-up and ownership of intellectual property.

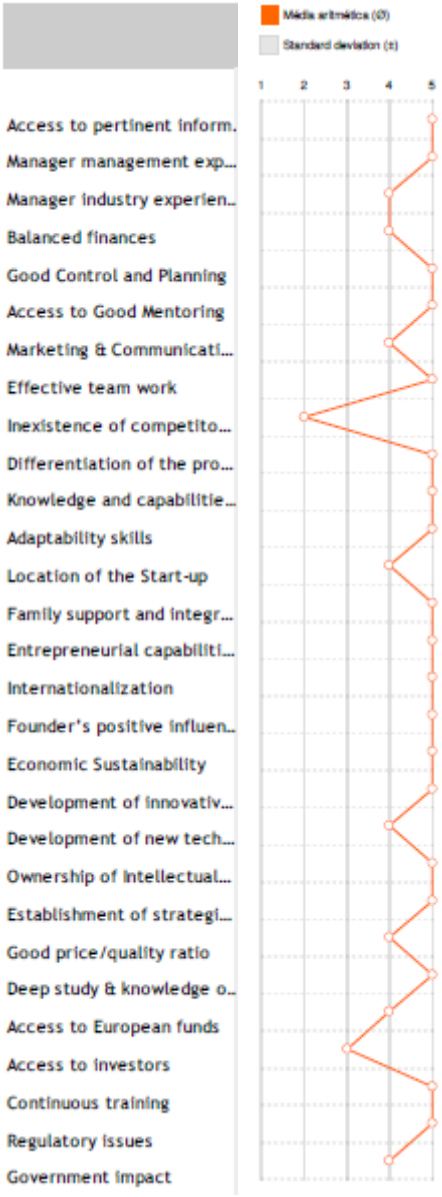
Success factors highlighted by the entrepreneurs
Good control and planning
Effective team work
Differentiation of the product/service
Knowledge and capabilities of the staff
Adaptability skills
Establishment of strategic partnerships

Table 26. Success factors most cited by the entrepreneurs

About the literature review, it is possible to extract from the table that the most cited author in this topic of the success factors is Halabí and Lussier (2014) with eleven (11) success factors mentioned. When related to the success factors, the most mentioned factors by different authors are the development of new technologies, the access to good mentoring and the development of innovative products.

The following figure (figure 18), presents in a graphic perspective the classification of each entrepreneur related to each success factor. These images are extracted from the database of Online Pesquisa where the questionnaire was developed.


Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Access to pertinent info...
Manager management ex...
Manager industry experie...
Balanced finances
Good Control and Plannin...
Access to Good Mentorin...
Marketing & Communicat...
Effective team work
Inexistence of competito...
Differentiation of the pr...
Knowledge and capabiliti...
Adaptability skills
Location of the Start-up
Family support and integ...
Entrepreneurial capabilit...
Internationalization
Founder's positive influe...
Economic Sustainability
Development of innovati...
Development of new tec...
Ownership of intellectua...
Establishment of strateg...
Good price/quality ratio
Deep study & knowledge...
Access to European funds
Access to investors
Continuous training
Regulatory issues
Government impact


Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Access to pertinent inform...
Manager management exp...
Manager industry experien...
Balanced finances
Good Control and Planning
Access to Good Mentoring
Marketing & Communicati...
Effective team work
Inexistence of competito...
Differentiation of the pro...
Knowledge and capabilitie...
Adaptability skills
Location of the Start-up
Family support and integr...
Entrepreneurial capabiliti...
Internationalization
Founder's positive influen...
Economic Sustainability
Development of innovativ...
Development of new tech...
Ownership of intellectual...
Establishment of strategi...
Good price/quality ratio
Deep study & knowledge o...
Access to European funds
Access to investors
Continuous training
Regulatory issues
Government impact


Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Access to pertinent info...
Manager management ex...
Manager industry experie...
Balanced finances
Good Control and Plannin...
Access to Good Mentorin...
Marketing & Communicat...
Effective team work
Inexistence of competito...
Differentiation of the pr...
Knowledge and capabiliti...
Adaptability skills
Location of the Start-up
Family support and integ...
Entrepreneurial capabilit...
Internationalization
Founder's positive influe...
Economic Sustainability
Development of innovati...
Development of new tec...
Ownership of intellectua...
Establishment of strateg...
Good price/quality ratio
Deep study & knowledge...
Access to European funds
Access to investors
Continuous training
Regulatory issues
Government impact


Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Access to pertinent info...
Manager management ex...
Manager industry experie...
Balanced finances
Good Control and Plannin...
Access to Good Mentorin...
Marketing & Communicat...
Effective team work
Inexistence of competito...
Differentiation of the pr...
Knowledge and capabiliti...
Adaptability skills
Location of the Start-up
Family support and integ...
Entrepreneurial capabilit...
Internationalization
Founder's positive influe...
Economic Sustainability
Development of innovati...
Development of new tec...
Ownership of intellectua...
Establishment of strateg...
Good price/quality ratio
Deep study & knowledge...
Access to European funds
Access to investors
Continuous training
Regulatory issues
Government impact

Figure 18. Graphic view of the entrepreneurs' classification to the success factors

The objective of the above figure is to compare the answers of the six (6) entrepreneurs with the success factors. As it is possible to state from the present graphics, all the answers are relatively different meaning that there isn't a consensual perspective among the factors that most contribute to the success among the entrepreneurs. The highest-level present in the questionnaire is the level 5, what means that there is no one success factor that all the start-ups that answered to the questionnaire totally agreed about their relevance in the start-up success. Explained by other words, this means that between the twenty-

nine (29) success factors identified on the literature review there isn't any that all the start-ups agreed about its importance on the start-up success. Some possible explanations for this situation, is that despite all the start-ups are operating in the same area – the health sector, all of them produce and develop different concepts and target different goals, what originate that the consensus is less likely to achieve. The several experiences are as well a possible factor once each entrepreneur perceives the success factor on a different way.

4.3. Performance Indicators and literature review

The following table (table 27), displays the performance indicators, by author and the answer of the entrepreneurs in the questionnaire. It allows to extract some of the main conclusions about the questionnaire as well as interconnect the conclusions of the questionnaire with the conclusions of the literature review about the performance indicators.

	Saunila (2017)	Ferra (2013)	Smith M. and Smith D. (2006)	Spillan and Parnell (2006)	Beaver (2003)	Pun and Hosein (2007)	Total	Questionnaire
Number of customers	x						1	3
Customer Satisfaction				x			1	3
Delivery within the agree timeframe		x					1	3
Few amount of bureaucracy			x				1	3
Staff satisfaction					x		1	3
Accomplishment of the targeted goals for the start-up					x		1	3
Profits	x						1	2
Entry in new markets	x						1	1
Sales Volume	x						1	1
Financial Performance	x						1	1
Rounds of investment						x	1	1
Number of units/products/services produced	x						1	0
Number of registered patents	x						1	0
Negotiation power towards the stakeholders		x					1	0
Total	7	2	1	1	2	1	14	

Table 27. The performance indicators and literature review

The above table interconnects the authors, the topics and the questionnaire results. From the table, it is possible to extract some conclusions about the performance indicators of start-ups in the health sector. Considering that six (6) start-ups answered the questionnaire, it is possible to conclude which indicators the most part of the entrepreneurs consider the most suitable to measure the performance of their start-up.

Analysing the above table about the performance indicators, it is possible to conclude that the performance indicators that were most appreciated by the entrepreneurs (3 start-ups answered the level 5) and that were above the average (4,125) are: the number of customers, the customer satisfaction, the delivery within the agreed timeframe, the amount of bureaucracy, the staff satisfaction and the accomplishment of the targeted goals. The findings in this section meet the findings present in the literature review. It was concluded that the prevalence should be on the costumer perspective what is represented here by the opinions of the entrepreneurs about the number of costumers and customer satisfaction. As pointed out by Spillan and Parnell (2006), these are one of the main objectives of the marketing, understand the costumer with the objective to deliver high value. In other perspective, the delivery within the agreed timeframe as stated by Ferra (2013), is an important indicator because it represents a compromise that is important to maintain towards the costumer. The amount of bureaucracy effectively exists in the health area as analysed by Smith M. and Smith D. (2006). However, the author defends that the processes must be simple and flexible in order to fluently create products with high-value. Finally, the staff satisfaction is perceived as other critical characteristics as pointed out by Beaver (2003), and it can be represented by the accomplishment of the targeted goals defined for the project team.

The performance indicators that collected less answers from the entrepreneurs (level 0) are: the negotiation power towards the stakeholders, the number of registered patents and the number of units/products/services produced. In this section, the customer indicators prevail over the financial ones. Regarding the intermediary level (level 3), the performance indicators that collected more answers (answers from 3 start-ups) were the number of registered patents.

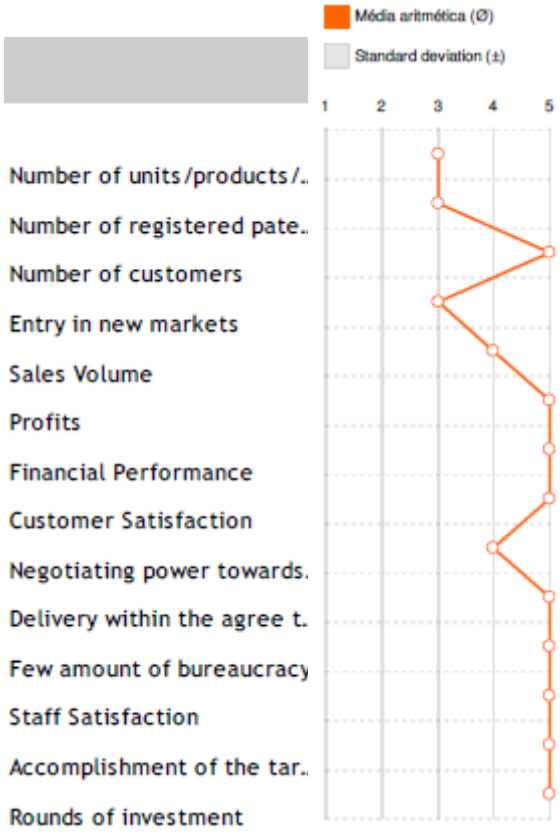
Performance indicators highlighted by the entrepreneurs
Number of customers
Customer satisfaction
Delivery within the agreed timeframe
Amount of bureaucracy
Staff satisfaction
Accomplishment of the targeted goals

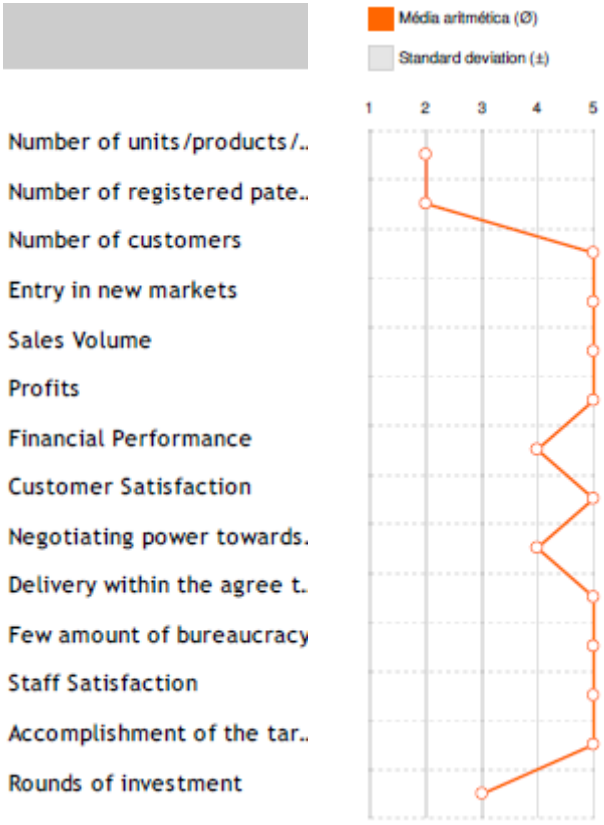
Table 28. Performance indicators most cited by the entrepreneurs

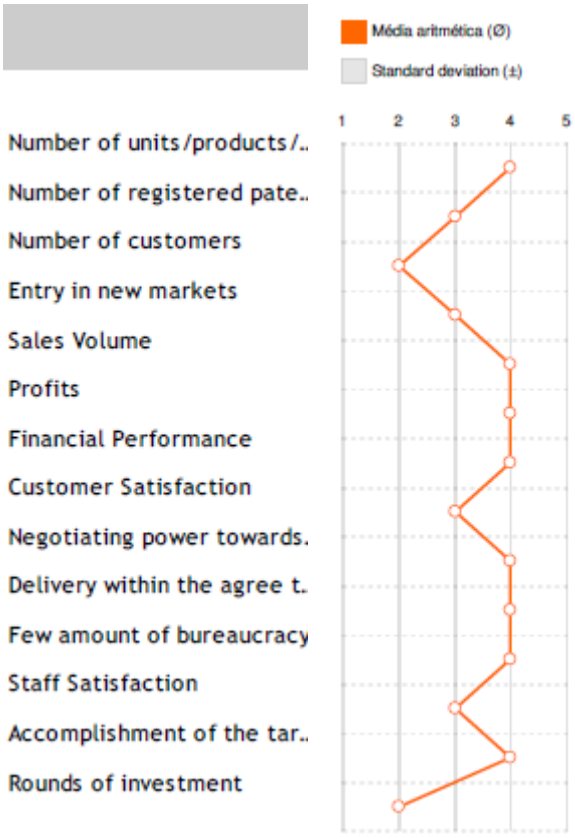
Regarding the literature review, it is possible to observe from the table number 25 that the most cited author is Saunila analysing seven (7) indicators. By its turn all the indicators were only mentioned by one and different author during this study.

The variance of the classification is notorious – some start-ups didn't highlight with the maximum level (level five) any performance indicators of the fourteen, while others start-ups highlighted with the maximum level nine (9) performance indicators of fourteen (14).

The following figure (figure 19), present the classification of each entrepreneur related to each performance indicator. These images are extracted from the database of Online Pesquisa where the questionnaire was developed.


Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Number of units/products/..
Number of registered pate..
Number of customers
Entry in new markets
Sales Volume
Profits
Financial Performance
Customer Satisfaction
Negotiating power towards..
Delivery within the agree t..
Few amount of bureaucracy
Staff Satisfaction
Accomplishment of the tar..
Rounds of investment


Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Number of units/products/..
Number of registered pate..
Number of customers
Entry in new markets
Sales Volume
Profits
Financial Performance
Customer Satisfaction
Negotiating power towards..
Delivery within the agree t..
Few amount of bureaucracy
Staff Satisfaction
Accomplishment of the tar..
Rounds of investment


Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Number of units/products/..
Number of registered pate..
Number of customers
Entry in new markets
Sales Volume
Profits
Financial Performance
Customer Satisfaction
Negotiating power towards..
Delivery within the agree t..
Few amount of bureaucracy
Staff Satisfaction
Accomplishment of the tar..
Rounds of investment

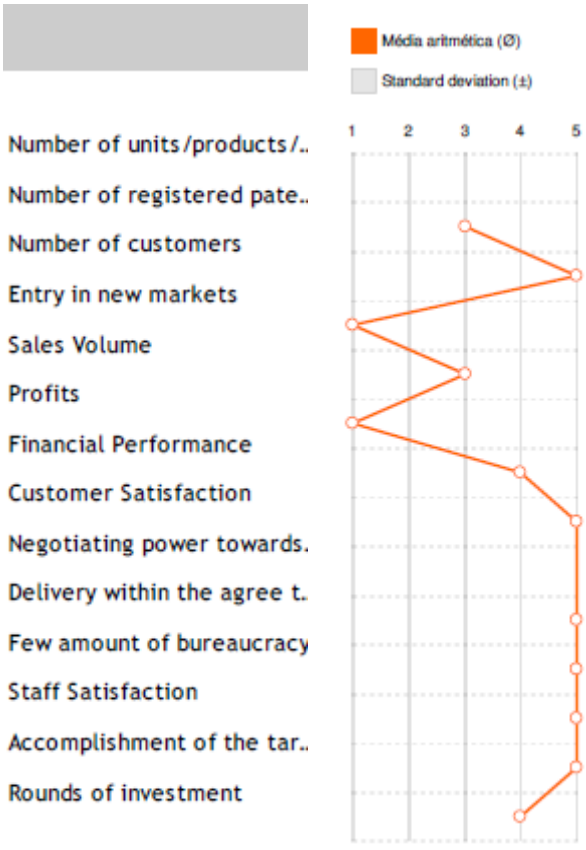

Média aritmética (Ø)
Standard deviation (±)
1
2
3
4
5
Number of units/products/..
Number of registered pate..
Number of customers
Entry in new markets
Sales Volume
Profits
Financial Performance
Customer Satisfaction
Negotiating power towards..
Delivery within the agree t..
Few amount of bureaucracy
Staff Satisfaction
Accomplishment of the tar..
Rounds of investment

Figure 19. Graphic view of the entrepreneurs' classification to the performance indicators

The objective of the above figure is to compare the answers of the four (4) entrepreneurs related to the performance indicators (in this question two (2) of the answers were invalid, that is way only four (4) are present instead of the six (6)). It is possible to observe from the present graphics that all the answers are relatively different which means that there isn't a consensual perspective among the indicators that entrepreneurs consider as the most suitable to measure the performance of the start-up. This can be due to different reasons mainly: the different specifications in the business of each start-up operating on the health area and the past experience of the entrepreneur in the business area once each one perceives each performance indicator on a different way.

5. Conclusions

This chapter include three (3) sections. The first section (5.1.), presents the main findings developed in this dissertation and its contributions to the knowledge and the theory in success factors and performance indicators related to start-ups' investigations. The second section (5.2.), provides contribution to the management fields that could be applicable to the daily operations of start-ups in the health area. Finally, the last section (5.3.), presents some of the main limitations of this study regarding the methods applied and, it provides several suggestions to be applied in following studies to improve the global investigations on this topic.

5.1. Contribution to theory

This conclusion reflects on the main findings of the study, revisiting the theoretical background that was applied in this dissertation and considering how the applied case studies contribute to increase the knowledge in the success factors and performance indicators related to the start-ups.

The main goal of this study was to provide a better understanding on *"What are the factors that most contribute to the success of the start-ups in the health area? And what are the suitable indicators to measure its performance*?" In order to answer these two questions, a revision of the literature was made and a questionnaire was applied. The case study analysis was applied as well, to start-ups in the healthcare sector, with the objective to match the main conclusions of the literature with the main conclusions of the case studies.

The findings suggest that the factors that entrepreneurs classify as the most relevant to achieve success are good control and planning, effective team work, differentiation of the product/service, knowledge and capabilities of the staff, adaptability skills and establishment of strategic partnerships. The literature identified 34 factors as relevant success factors, however analysing the aggregated opinions of several entrepreneurs the most crucial ones in the development of the start-up activity are the six (6) stated above in concordance with the authors' opinion of Halabí and Lussier (2014), Omri et al. (2015) and Konno (2015).

About the second research question, the indicators that entrepreneurs classified as the most suitable to measure the performance are the number of customers, the customer satisfaction, the delivery within the agreed timeframe, the amount of bureaucracy, the staff satisfaction and the

accomplishment of the targeted goals. The literature identified 14 performance indicators as the most suitable to measure the performance of start-ups. However, the entrepreneurs highlighted the six (6) stated above in concordance with the opinions of the authors Spillan and Parnell (2006), Smith M. and Smith D. (2006) and Beaver (2003).

This divergence between the literature review and the case studies conclusions means that some of the identified success factors and performance indicators in the theory are not considered so relevant by the entrepreneurs, in the management of start-ups. This can happen due to the fact that the targeted entrepreneurs are a small part of the universe of the start-ups operating in the health area in Portugal, so it is not possible to reflect the opinion of all the universe that could globe other performance indicators. Other possible reason are the differences and specifications of the several businesses operating in the health sector in Portugal that leads to these inevitable differences.

5.2. Contribution to management

This study can be interpreted as a guide model. Through this study, it was possible to conclude which factors contribute the most to the success of the start-ups as well as for the identification of the indicators that are most suitable to measure the performance of start-ups, This study can be used as a guideline model for future start-ups by identifying these success factors and progress with them. In other words, when a business is launched, entrepreneurs, analysing this dissertation, can know which factors they should work on more intensively in order to succeed. They know as well which indicators to analyse in order to evaluate the performance of their start-up correctly. As mentioned in the abstract the further objective of this investigation is the creation of an aggregated indicator constructed through an weighted formula that could attribute to each start-up a performance indicator, including several variables.

5.3. Limitations and suggestions for future research

During the elaboration of an investigation, it is important to have the humility to recognize the aspects that can be improved and the suggestions to future researches to improve the general knowledge in the topic that is studied.

To do so, in this sub-topic will be presented some of the main limitations of this study that can be eliminated in future researches and some suggestions based on the improvements and on other different studies and perspectives that can be targeted in following studies.

Regarding the limitations, this research focused on only one scientific park of analyse – UPTEC, what limit the base of the analysis. If other parks were included in the study as well, such as the scientific park of Braga, Coimbra and Lisbon, the basis of the analysis would be broader and will represent the reality on a truthful perspective.

The second limitation is related to the start-ups that are present in this dissertation. -Several of them didn't answered the questionnaire that was proposed and sent to them, lowering the response rate, that in this case was around 33,33%. If more entrepreneurs had answered to the study, the reality that was proposed to study, could be reflected on a more realistic way.

The third limitation is concerned with the chosen performance indicators for this study. As it is known, in this study, performance indicators such as number of customers, sales volume and staff satisfaction were used. During the elaboration of this study, some other technical performance indicators were suggested to use for future researches such as unit/total sustainability, customer acquisition cost and lifetime value.

As a fourth limitation, this study doesn't involve deep statistical analysis, considering it is a case study approach. In future studies, it can be applied a methodology based on statistical data in order to generalize the results to a larger scale.

Finally, and as a major suggestion/conclusion for future studies it would be interesting if the same methodology of this dissertation will be applied to different areas – different from the health area – in order to discover and formulate a global pattern for this research questions. In the end of all the studies the objective will be to find out which are (if there are) the common success factors to all start-ups of different areas and in the same line, which are the suitable performance indicators to measure the performance of the start-ups on a broad sense (common to different areas).

Another interesting suggestion related with the previous one, will be to transpose this analyse to several countries – instead of different areas. For example, for all the European Union countries, analyse the same two research questions by selecting a scientific park with start-ups acting on the health sector. The objective will be to identify common patterns between countries

that allow to state, for example: the factors that most contribute to the success of start-ups acting on the health sector on Portugal and Spain are the same. The same happens with France and Germany. By its turn, Poland and Austria have no one in common - and so on.

A different suggestion that could be interesting to operate in the future is the construction of an aggregated indicator that could evaluate a start-up and that could inform about the likelihood of the success of that start-up in the future or even the probability of not succeed in a future of a determined number of years. This indicator could be computed using a formula that aggregates several different performance indicators, weighted by a factor.

To finish the conclusions chapter, it is important to have in mind that start-ups' business are constantly moving on high-speed velocity, challenging every day the entrepreneurs' knowledge and the implemented procedures on the market, always searching for the excellence in the construction of tomorrow.

Appendix

Appendix 1. Questionnaire

Start-ups in the Health Sector 0 %

Questionnaire

This questionnaire is directed to the founder or manager of the company. Its purpose is to realize a market study, to the dissertation of the Master in Management at Faculdade de Economia da Universidade do Porto. The objective of this questionnaire is to understand what are the success factors of Start-ups located at UPTEC in the health sector and understand if there is any connection between these success factors and the performance of the Start-up. This questionnaire is confidential. The data will be analysed in an aggregated mode, which means that the anonymity is respected. The questionnaire is divided in three parts (the approximately answer time is about 5 min) and all the questions are mandatory except the last question in the end of the second and third part.

Notes: In the case of two or more founders/managers, the questionnaire should be filled together with the opinions of all. (For example: if there are three founders in which two of them are female and the other one is male, the square respecting the female gender should be filled with the number two and the square respecting the male gender should be filled with the number one. The same applies for the following questions in the First Part: Position in the company, Academic qualifications and Age).

Thank you for your attention.

First part - Global part

Name of the Start-up (this question is only for the control of the respondents)

In which section of UPTEC is the Start-up established?

Number of respondents

Gender

Female

Male

Position in the Company

Founder	
Manager	
Both	

Academic qualifications

4º year	
9ºyear	
12º year	
Professional Course	
Graduation	
Post- Graduate	
Master	
PhD	
MBA	
Other	

Age

Respondent 1	
Respondent 2	
Respondent 3	
Respondent 4	
...	

Inception of the Start-up

Number of workers at the Start-up

Approximate Annual sales volume (euros)

Second Part - Success Factors

Using a scale between 1 (nothing important at all) to 5 (very important), mark in the respective circle the suitable classification.

What are the factors that you consider as the most relevant and important to achieve the actual or future success in your Start-up?

	1	2	3	4	5
Access to pertinent information	○	○	○	○	○
Manager management experience	○	○	○	○	○
Manager industry experience	○	○	○	○	○
Balanced finances	○	○	○	○	○
Good Control and Planning	○	○	○	○	○
Access to Good Mentoring	○	○	○	○	○
Marketing & Communication	○	○	○	○	○
Effective team work	○	○	○	○	○
Inexistence of competitors/substitute products	○	○	○	○	○
Differentiation of the product/service	○	○	○	○	○

Knowledge and capabilities of the staff	◯	◯	◯	◯	◯
Adaptability skills	◯	◯	◯	◯	◯
Location of the Start-up	◯	◯	◯	◯	◯
Family support and integration in the Start-up management	◯	◯	◯	◯	◯
Entrepreneurial capabilities	◯	◯	◯	◯	◯
Internationalization	◯	◯	◯	◯	◯
Founder's positive influence	◯	◯	◯	◯	◯
Economic Sustainability	◯	◯	◯	◯	◯
Development of innovative products	◯	◯	◯	◯	◯
Development of new technologies	◯	◯	◯	◯	◯
Ownership of Intellectual Property	◯	◯	◯	◯	◯
Establishment of strategic partnerships	◯	◯	◯	◯	◯
Good price/quality ratio	◯	◯	◯	◯	◯
Deep study & knowledge of the marketplace	◯	◯	◯	◯	◯
Access to European funds	◯	◯	◯	◯	◯
Access to investors	◯	◯	◯	◯	◯
Continuous training	◯	◯	◯	◯	◯
Regulatory issues	◯	◯	◯	◯	◯
Government impact	◯	◯	◯	◯	◯

Other?

Third Part - Performance indicators

Using a scale between 1 (Not suitable) to 5 (Totally suitable), mark in the respective circle the suitable classification.

What are the performance indicators that you consider more suitable to measure the success of your Start-up?

	1	2	3	4	5
Number of units/products/services produced	○	○	○	○	○
Number of registered patents	○	○	○	○	○
Number of customers	○	○	○	○	○
Entry in new markets	○	○	○	○	○
Sales Volume	○	○	○	○	○
Profits	○	○	○	○	○
Financial Performance	○	○	○	○	○
Customer Satisfaction	○	○	○	○	○
Negotiating power towards the stakeholders	○	○	○	○	○
Delivery within the agree timeframe	○	○	○	○	○
Few amount of bureaucracy	○	○	○	○	○
Staff Satisfaction	○	○	○	○	○
Accomplishment of the targeted goals for the Start-up	○	○	○	○	○
Rounds of investment	○	○	○	○	○

Other?

This is the end of the Questionnaire.

Thank you for your collaboration.

Appendix 2. Interviews

After the selection of the start-ups for the interviews, the objective was to know a little bit more about each start-up and the project that entrepreneurs had developed. Besides that, to go deeper in each factor of the questionnaire and to collect other success factors and performance indicators that entrepreneurs consider important were the two other objectives. The interviews were realized on a semi-structured way, and ponctual different questions were established with the several involved start-ups in these interviews.

First Interview - SurgeonMate represented by Dr.Nuno Muralha

SurgeonMate

SurgeonMate is a start-up company that develops products that aim to improve the performance of the cirurgeons. Dr.Nuno Muralha is a doctor.

Guide

1- How the project of SurgeonMate can be descripted? How the idea was developed?
2- Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each success factor?
3- And performance indicators?
4- Which other success factors and performance indicators are relevant to include in the questionnaire?

Answers

1- How the project of SurgeonMate can be descripted? How the idea was developed?

The idea appeared on a trip to South Africa where Dr.Nuno Muralha was inserted in. He conclude about the poor means of the cirurgeons equipment and he had the desire and motivation to create improved and efficient utensils. In Europe, the available instruments were more deveped but anyway, some improvements could be done.

2- Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each success factor?

The interviwee consider pertinent to go deeper in the factors related to the information and the team working on the project and Dr. has elaborated some resumeed comments about them. About the potential that the access to pertinent information can bring to the start-up, Dr.Nuno consider that process effectively the information that is available to the entrepreneur and know how to expose the ideias is fundamental. The good control and planning in its opinion is crucial and it is present in several dimensions, for example in the management of the budget and in the management of the team that works on the project. Mentoring assumes a preponderant role, and in this subject and according the interviwee opinion, UPTEC was crucial to create the needed support and the management practices for the development of the project. Dr.Nuno agrees that the most relevant support in this process were the areas of marketing and communication. When asked about the team contribution, the interviewee has no doubt about the relevance of the staff that work in the project. He defends that it is extremely important to create a solid and helpful team. About the localization of the start-up, Dr.Nuno agress that it can be analyzed from two different perspectives that can be a strategic factor. For example, Lisbon is a great place to install the start-up once it has excellent acessibilities and a strong economic power. However, when the analysis is focused on the community funds, it is a disadvantage to be located in Lisbon once there are few funds allocated to that region once it is already so developed that won't need so much funds like other regions. About family support, Dr.Nuno consider that it is important but not essencial for the success of the project. When asked about the importance of the diferentiation of the product, the interviewee agrees that it is crucial. The start-up can't be only "one more" in the market and needs to add value to something. About the patent issues, Dr.Nuno consider that it is not crucial for the success of the start-up. He don't consider that to have something completely new needs to be developed. Instead, he thinks that it is more important to use already existing technology and create a new incredible product. About the european funds, he clearly answered that he didn't had access to european funds or investors and consider that more important than the collection of money is crucial a good business and a strategic partner. When asked about the bureaucracy, Dr.Nuno exposed that nowadays in Portugal the process of creating a company is relatively simple.

3- <u>And about the performance indicators?</u>

About the second question of the questionnaire relatively to the performance indicators, the doctor defends that a good business plan is more important that sales volume because if there is a sustained management of the start-up the financial performance by inherence will be good

as well. The focus must be in the client satisfaction because if the client is satisfied he will come back and possibly bring more clients. Delivery within the agreed time frame is crucial because it transmitts compromise towards the client. About the management of the team, the doctor argues that more important that the group be satisfied is to be accomplished the targeted goals.

4- Which other success factors or performance indicators beyond the ones present in the questionnaire are important to mentionate?

In the opinion of Dr.Nuno, in general, the questionnaire is complete and the most part of the factors are targeted. However, if the doctor will include more, he will add undoubltly good luck and humility as important factors to succeed.

As the interview was done on a semi-structured way, some other pertinent questions were possible to establish in the end of the interview:

5- What was the main feedback expressed through the lenses of the cirurgeons that already experienced the product of SurgeonMate?

The receptivity of the cirurgeins was great. From his experience, Dr.Nuno observe that cirurgeons have a notorious willingless to learn more everyday, what is very beneficial for his project and to the medicine and the users in general.

6- Which advices are important to someone that wants to initiate its business? (independently of its age, academic qualifications and businees area).

Dr.Nuno consider that the most important aspects are the belief in 100% in the project that is being developed as well as in the ideia. The resilience is a characteristic that needs to be strongly present.

7- What is the opinion about international and formatted programms such as “Shark Tank” to contribute and transform the ideas of start-ups in successful business?

The interviewww consider that “Shark Tank” is a risky option for start-up business. It is a big and attractive entrance and in some cases it goes well but in general the preparation of the speech needs to be elevated because there is no second chance to create a first good impression.

Second Interview - Moldaro represented by Dr.João Amaro

Moldaro

Moldaro is a start-up that dedicates to the production and comercialization of medical footwear to people with sequelae of chronic diseases. Dr.João Amaro is a doctor.

Guide

1- How the project of Moldaro can be descripted? How the idea was developed?
2- Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each success factor?
3- Which advices are important to someone that wants to initiate its business? (independently of its age, academic qualifications and businees area).

Answers

1- How the project of Moldaro can be descripted? How the idea was developed?

The project of Moldaro started in 2014 with the development of the first prototype of medical footwear. The main motivations at that time to Dr. João initiate this project were the insatisfaction about its professional work at that moment and the influencies of the social communication about the benefits to be an entrepreneur and the incentives to create its own business. Of course, all of this associated with his strong belief and passion in the project. Nowadays, the medical shoe that Moldaro developed is not being commercialized for several reasons that the interviewee explained during the interview. In this moment of the project and his life, the cost of going forward with the project is higher than the benefit that it will proportionate, so the decision to stop with it. Therefore, nowadays, Moldaro is dedicated to the provision of clinical rehabilitation services.

2- Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each success factor?

When asked about the factor of the regulation of the market and imposed by the government, the interviewee explained that the regulation exists in theory but in practice the market is highly desregulated what is extremely prejudicial for the business. Dr.João considers that this is one of the biggest obstacles to the presence in the market. He consider that several times entrepreneurs don’t have the nedeed formations in the business sciences, that are important to

successfully manage the business. However, in its case, that didn't happen because UPTEC proportionated the nedeed mentoring to suceed in the project. The science park provided several instruments and formations on how to elaborate a business plan focusing on the marketing and communication areas. The mutual aid between several ompanies is present at the scientific park as well. About the patents, doctor argued that nothing in Moldaro is patented once they did not have relevant new technologies to patent. The doctor consider that innovation is important in the health area but is not the only way to achieve success. Besides the development of the product, it is crucial the need to exist a relevant market to commercialize the products that are developed. He considers that the focus and knowledge of the team is more important than the technological innovations. About the ratio between price and quality, in this industry, the doctor consider that it is possible to present products with high quality to a competitive price, when the production is made by a dominant and installed company in the market. When asked about the conditions that are needed for a start-up deal with investidors, Dr.João answered that it is needed to have the ideas and objectives extremely well structured, defined and developed to construct an effective pitch. When the investors enter in the project, the pressure to return the money exists and the need to present results within certain timeframes needs to be managed. The doctor assumed that, in some cases of the medical start-ups, the European funds are not applicable. Finally related to internationalization, before go abroad it is important to deeply analyze the foreign markets and the competition in that markets. A cost-benefit analyze should be made in order to understand if the entrance in new markets is viable and beneficial.

As the interview was done on a semi-structured way, some other pertinent questions were possible to establish in the end of the interview:

3- Which advices are important to someone that wants to initiate its business? (independently of its age, academic qualifications and businees area).

The interviewee consider that one of the main mistakes of the entrepreneurs of start-ups is to be passioante about their products and start to develop the product on a over perfectionist way, neglecting the market and the analysis of the demand for the product and the communication plan to present the product. That is why, several times, start-ups create concepts and prototypes but not move forward to the commercialization of the product. Sometimes they don't do market analysis before developing the product and they neglect the market wishes and needs. With this

advertence in mind, doctor advice entrepreneurs to first develop a simple and basic prototype of their product and then enter in the market, exploring it and get in touch with the already installed companies in the market, collect their opinion and present them the developed product to understand the viability of the product. Sometimes, sell the ideia or the prototype is definitely the best decision.

Third Interview - Knok represented by Dr.José Bastos

Knok

Knok is an online platform that proportionates virtual appointments between doctors and users. The objective is to decrease the waiting times for the provision of the service and to personalize the relationship between the doctor and the user. Dr.José Bastos is economist.

Guide

1- How the project of Knok can be descripted? How the idea was developed?
2- Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each success factor?
3- And about the performance indicators?
4- Which other success factors and performance indicators are relevant to include in the questionnaire?

Answers

1- How the project of Knok can be descripted? How the idea was developed?

The idea of creating Knok appeared from a personal need when Dr.José Bastos conclude about the needed time to go to medical appointmets and the impact that it can have in our personal and professional life. He concluded that a critical problem of nowadays experienced by doctors is the need of time. Besides that, doctors are not being correctly payed having in account the exigency of their job.

2- Evaluating the questionnaire, which are the pertinent considerations to be made to go deeper in the analysis of each success factor?

When asked about the importance of relevant information, Dr.José answered that when entrepreneurs are developing a product or service that does not exist, relevant information is never enough to understand more and more about the business. The interviwee considers that

its management experience was crucial as well as experienced several professional years working on different projects. He consider that good mentoring is important but in Portugal is not yet properly developed. A crucial factor that Dr.José exalted that the inexistence of competitors, nowadays, is not possible in any area. However, that is not a problem for the success of the project, once there are several examples of companies that are world wide successful and operate in highly croweded markets. About the economic sustainability, Dr.José Bastos argued that it is important to divide that factor in two different dimensions: one factor is represented by the sustainable economic unit and the other is the global sustainable economic. In start-ups this concept acquires important relevance once usually when the start-up initiates its economic activity it's frequent to lose money in every unit that is selled because the company has not yet achieved the break even point to start to start to profit. It is needed to achieve a determined sold quantity in order to profit. About the partnerships in the health sector, Dr.José Bastos defends it is crucial for the development of the project, to include partnerships with investidors or other strategic partners. The good price/quality ratio is fundamental and its economic designation is the value proposition. The interviewee exalted the importance of the team that is inserted on the project working on with consistent preseverance. When asked about the priority of finances when compared to the customer's needs, without hesitating, Dr.José answered that the customer satisfaction must prevail over the financial analysis in the initial phase of the development of the project.

3- And about the performance indicators?

The entrepreneur refered that two indicators are important to analyze when the performance of the start-up is being considering: the customer acquisition cost and the lifetime value. The customer acquisition cost is the amount that the company needs to invest to attract the customer. The lifetime value is an indicator that estimates the potential revenue and profit genereated by the customer. These two indicators need to be compared in order to determine the liquid situation, i.e., if the customer is proportionating profits or losses to the company.

4- Which other success factors and performance indicators are relevant to include in the questionnaire?

Through its researches, Dr. José Bastos consider crucial the consistent hard work, the number of working hours, the suffering spirit and the persistence as key variables to succeed.

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